the FIELD PROCESSING
OIL AND GAS JOURNAL

that finishing touch

. . . like dotting the "i"

NATURAL GASOLINE

gives that finishing touch—
"RETAINED VOLATILITY"

to YOUR Motor Fuel

Working up unfinished gasoline stocks to meet the vagaries of Motor Fuel demand in the Spring is no problem when you rely on WARREN for the Quantity and Quality of Natural Gasoline . . . when and where you want it.

WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA • Cable Addresses: STAVOLENE, WARREN

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN
TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 APRIL 26, 1954

CEMENTING... is a measure of men

Created equal though men are, their skills will differ in degree and direction. For the highly specialized job of cementing, Halliburton selects its men from a field of many trainees. Careful, thorough training on every type of well develops their skills to the highest degree. Then follows a rigorous period in actual well experience before they earn the coveted title of Halliburton Cementer. They have the knowhow to consult and advise the well operator on any well cementing problem. By its million-job experience and quarter-century research, Halliburton knows that cementing is a measure of men — and Halliburton develops men who measure up to its leadership in the field.

HALLIBURTON OIL WELL CEMENTING COMPANY

"THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING."

DUNCAN, OKLAHOMA

the OIL AND GAS JOURNAL

APRIL 26, 1954 VOL. 52 NO. 51

OIL IN THE NEWS . . .

A.P.I. Forecasts Record Capital Outlay for 1954 114
Stanolind Lets Contract for Revamping Synthesis Plant 115
Study Shows Gas Turbine Valuable in Pipeline Operation 116
L.P.G. Outlook Good for '54, N.G.A.A. Meeting Told 117
Symposium on Additives Fails to Achieve Harmony of Views 118
FPC Reverses Acquisition Cost Policy in Setting Pipeline Gas Rates 120
Congress Unlikely to Pass Administration Trade Policy This Year 121
Government Plans to Speed Disposal of Synthetic-Rubber Plants 122
Supreme Court Asked to Settle Old Land-Scrip Question 123
Drilling to Be Resumed on Wildcat in Alaska's Interior 123
First Well Spudded in Gulf of Mexico Since Tidelands Act 124
Contract Let for Mobile Platform Designed for Deep Water 125
Railroad Commission Deliberates Shutting In Round Top Field 126
Higher Crude Imports for April-July Estimated by Companies 127
Construction Starts on $20 Million Refinery Near Montreal 128
French Wildcat Discovery Apparently Western Europe's Best Well 129
Rotary Rigs Outside United States Hit All-Time Record 130
Reports Indicate Teheran Negotiators Solve Major Problems 131
Peron Personally Offers Inducements for Argentine Oil Development 131

FIELD PROCESSING SECTION . . .

INSTRUMENTING THE FRACTIONATION SECTION 136
N.G.A.A.-C.N.G.A. TRAY DESIGN FORUM 152
Bubble Caps 152
By R. M. Young
Perforated Plates 155
By D. C. Lee
Recyling Tray 158
By E. G. Ragatz
Shell Turbogrid 161
By J. A. Samaniego
Float-Valve Bubble Trays 165
By I. E. Nutter
Socony Uniflux 176
By V. O. Bowles
Gulf Perforated Plate 180
By A. C. Eld
Koch Kaskade Flexitray 190
By G. C. Thrift

NEW FIELD PROCESSING DEVELOPMENTS . . .

Sulfur Recovery from H_2S 218
By H. L. Hays and F. T. Barber
High-Pressure Gas Production 227
By T. E. Griffith and C. O. Miller
Latent Cooling of Compressor Engines 231
By H. Menard and E. D. Blossom
H_2S Removal Using Amine Units 280
By R. A. Feagan, H. L. Lawler, and M. H. Rahmes
THE JOURNAL'S ANNUAL GASOLINE-PLANT SURVEY 196-216

TECHNOLOGY AND OPERATION . . .

New Gas Pipeline Cleaning Method 237
How Shell Saves Pipe in Casing-String Design 242

EXPLORATION . . .

Williston Has Rewarding First Quarter 323
Completions Gain 17 Per Cent in First Quarter 324

NEWS FEATURES . . .

They Say 101
Calendar of Events 104
Journally Speaking 109
Editorial 111
This Week 113
Watching Washington 122
International News 129
Personals 132
Deaths in the Industry 134
Refining News 309
Petrochemical News 311
Pipeline News 313
Natural-Gas News 321
Natural-Gasoline News 321
Statistical Summary 345
Drilling Statistics 346
Supply Statistics 347
Refining Statistics 348
Demand Statistics 349

DEPARTMENTS . . .

Books 225-236
Pipeline Patrol 247
Questions on Technology 254
Modern Drilling 257
On the Job 288
Equipment Men in News 293
Classified Advertising 350
Advertisers' Index 355

FIELDS . . .

Drilling Contractors 319
Area Field Reports 328

In Brief . . .

Here are the special sections in the Journal's 1954 Field Processing Number:

Questions and answers dealing with the problems that arise when instrumenting the fractionation section in natural-gasoline or cycling plants. Begins with discussion of selected portions of column control and ends with over-all instrumentation of four-column fractionation train.

Eight papers taken from C.N.G.A.-N.G.A.A. forums on tray design, showing the current thinking on this subject. Better performance with bubble caps, and proper design of perforated plates are covered. New liquid-vapor contacting devices covered include (1) recycling tray, (2) Shell Turbogrid, (3) float-valve bubble tray, (4) Socony Uniflux or R.E.D. tray, (5) Gulf perforated plate, and (6) Koch Kaskade trays.

Other developments in field processing covered in this issue include a paper on economics of sulfur-recovery operations by Phillips engineers. Stanolind Oil & Gas Co. experience with amine units for H_2S removal is dealt with in another article. The possibilities inherent in latent cooling of engines are emphasized by engineers of Signal Oil & Gas Co. Problems with corrosion and wax content encountered by Tide Water Associated Oil Co. in high-pressure gas production in Louisiana are also covered.

"National security is impossible without financial security of individual citizens..."

FRED MAYTAG
The Maytag Company

"Ingenious research and the ability to produce . . . which have helped to make the United States the world's greatest nation . . . could not have been realized without the savings of millions of thrifty persons. Savings of individuals financed new inventions, developed others. The Payroll Savings Plan for purchasing Savings Bonds regularly provides an easier way for American workers to save for future spending or investment, for their own security, and for their nation's security. Our experience at the Maytag Company has shown us that a successful Payroll Savings program can be the foundation and the cornerstone of happy employee relations."

Let's point up Mr. Maytag's concise summary of the Payroll Savings Plan with a few very recent figures:

• at the close of February, 1953, the *cash value* of Series E Bonds held by *individuals* reached a new high: $35.5 billion. This is $1 billion more than the value of the Bonds held on May 1, 1951, when E Bonds began to mature.

• to this encouraging reservoir of future purchasing power, 8,000,000 Payroll Savers are adding $160,000,000 per month by their consistent investment in U.S. Savings Bonds.

• unit sales of E Bonds in 1952 reached the highest level of the past six years—more than 77 million individual pieces. Of the 77 million units, 67 million were in the $25 and $50 denominations—the bonds bought chiefly by Payroll Savers.

• Payroll Savers are serious savers—of the approximately $6 billion Series E Bonds which had become due up to the end of March, $4.5 billion, or 75%, were retained by their owners beyond maturity.

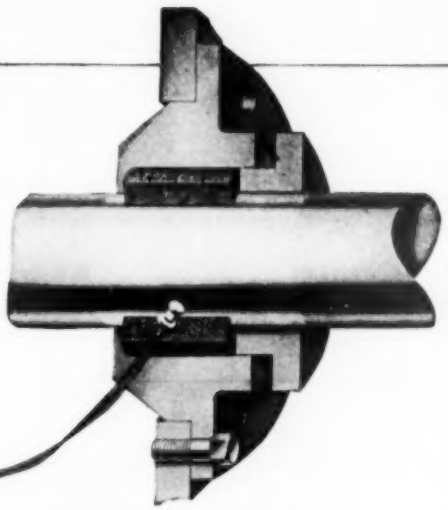
If you are not among the 45,000 companies that make the benefits of the Payroll Savings Plan available to their employees . . . or if you do have a Plan and your employee participation is less than 50%, a telegram or letter to Savings Bond Division, U.S. Treasury Department, Washington Building, Washington, D. C., will bring you all the information and assistance needed to build a *good* Payroll Savings Plan.

The United States Government does not pay for this advertisement. It is donated by this publication in cooperation with the Advertising Council and the Magazine Publishers of America.

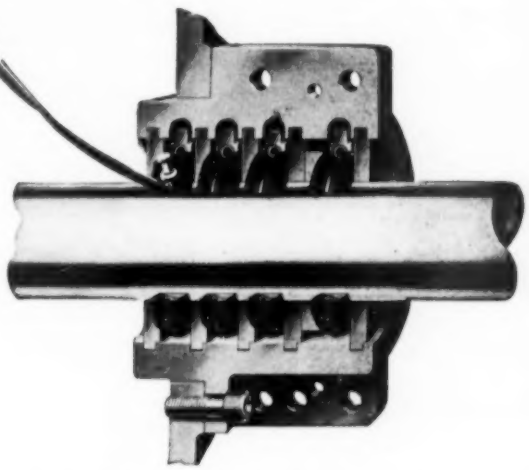
THE OIL AND GAS JOURNAL
TULSA 1, OKLAHOMA

COPPUS TURBINES

offer you a choice of packing rings



STANDARD METALLIC RING PACKING — Made of high grade asbestos cores encased in specially treated lubricated aluminum foil. Recommended as a low-friction, long-service packing for steam temperatures up to 850 F and back pressures up to 50 lb. Adjustable packing glands keep leakage at minimum. Easy access to packing rings.



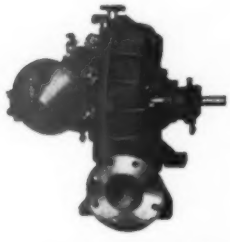
OPTIONAL CARBON RING PACKING — Consists of three carbon packing rings on the pressure side and one beyond the leak-off section. Each ring has three segments held together by a stainless steel garter spring. For back pressures up to 75 lb. Standard for vacuum or gas operation, or when leak-off is desired.

Heavy chrome plating on shaft at stuffing box is common to both types of Coppus packing.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

FIT TURBINE COSTS TO HORSEPOWER NEEDS

When you buy turbines rated close to your exact horsepower needs, you save plenty of money. That's because turbines are generally priced in proportion to their size. The wide range of sizes of Coppus Turbines promises purchasing economy for you from the 150 hp size down to the smallest. As for operating and maintenance economies, you get them, too, from such other features as: greater number of manually operated valves for individual control of steam nozzles; replaceable cartridge-type bearing housings and others. For complete details . . .

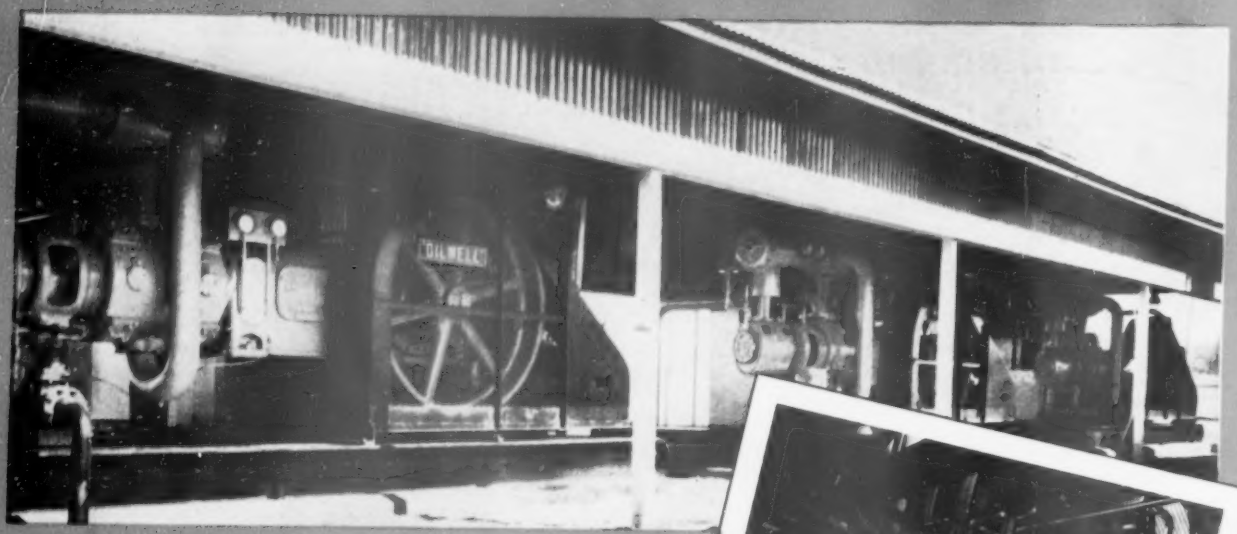


WRITE FOR BULLETIN 135
COPPUS ENGINEERING CORPORATION
265 Park Avenue
Worcester 2, Mass.
Sales offices in
THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

The Oil and Gas Journal, published Mondays, copyright 1954, by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.

Three "Oilwell" Compressor Units ...handle the gas from start to finish



...in this skid-mounted Portable Gasoline Plant

WHEN TURNER & WEST of Graham, Texas purchased this portable gasoline plant which is located near Loving, Texas, "Oilwell" Compressor Units were selected because of the consistently good performance and low-cost maintenance records that previously purchased "Oilwell" units had established for this customer.

Wet gas from the separator enters the compressors at atmospheric pressure and is boosted to 150-200 psi as required for processing through the plant.

A total of 275 hp is required to drive the three packaged compressors. Two GBU-75 two-stage units each have a maximum capacity of 500,000 cubic feet of gas per 24 hours of operation and one GBU-125 two-stage unit has 750,000 cfd capacity.

When you have GAS PUMPING Problems

...let an "Oilwell" representative quote on the "Oilwell" Units that meet your requirements most economically throughout the 20 to 300 hp range.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices— CALGARY, CANADA
CASPER, WYOMING . . . COLUMBUS, O.
DALLAS, TEXAS . . . HOUSTON, TEXAS
TULSA, OKLA. . . . LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS TRADE MARK

"OILWELL"

TRADE MARK

UNITED STATES STEEL

It's SMALL but MIGHTY!

The New AMERICAN T3

Features of the T3D-D10

- Designed for shallow wells.
- Manufactured to Exacting A.P.I. Specifications.
- Arc type hanger easily removed for servicing.
- Bronze bushed Saddle and Equalizer Assemblies.
- Four-legged, derrick-type Samson Post.
- Sealed bearing assemblies.
- Long Lasting Herringbone Geared Reducer.

Now . . . the American T3D-D10 completes the greatest line of pumping units made. It's the perfect answer to economical pumping of shallow, small capacity wells. Precision made, like all its big American brothers, the T3 will give you years of service for a minimum of maintenance. And, when you check its price against its quality, you'll find the American T3, the BEST BUY in the oil fields.

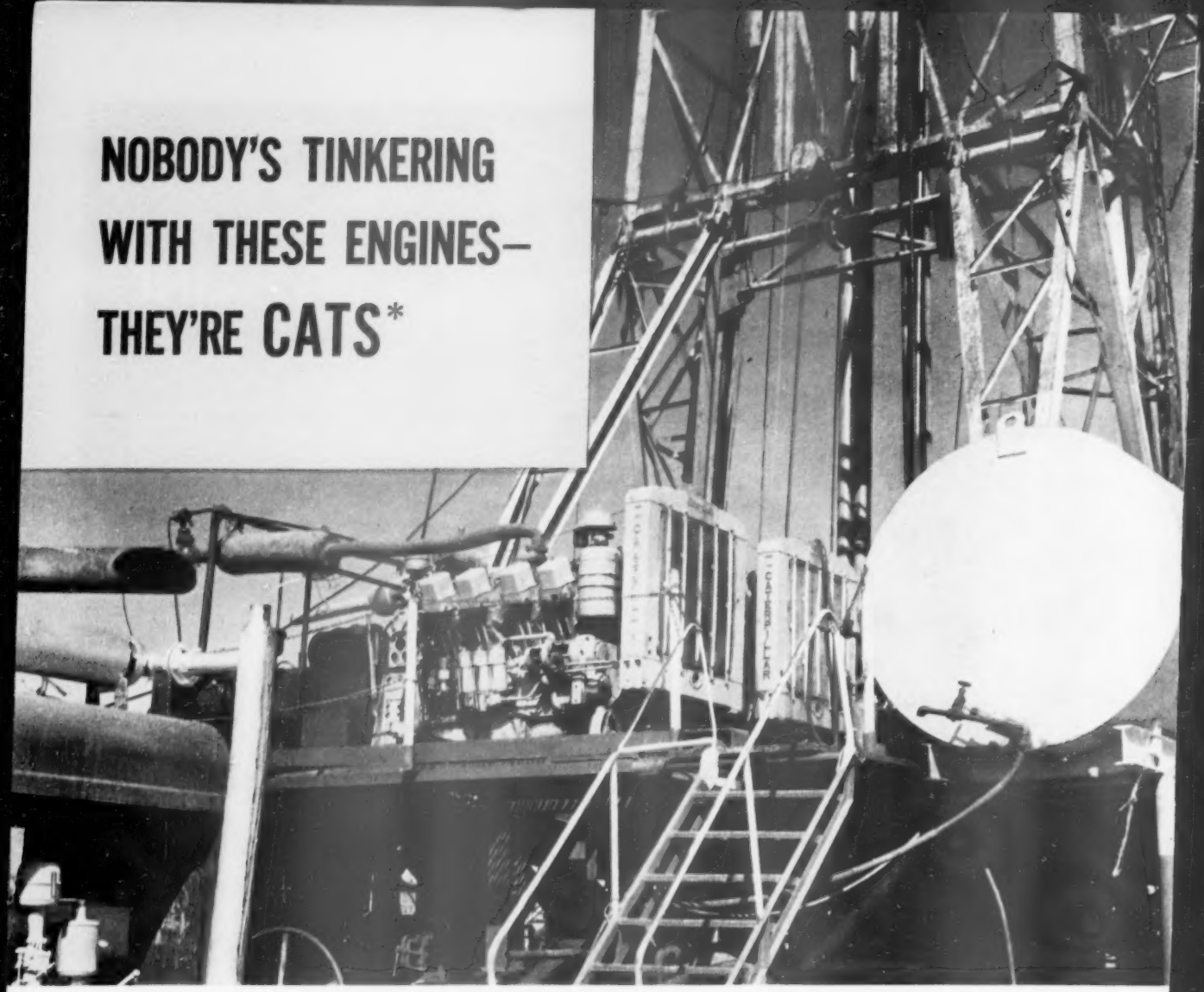
AMCOT

AMERICAN MFG. CO. OF TEXAS

P. O. BOX 7037 • FORT WORTH 11, TEXAS

Odessa • Tulsa • Kilgore • Houston • New York • Casper • Calgary, Alba

NOBODY'S TINKERING WITH THESE ENGINES— THEY'RE CATS*



Three Caterpillar Oilfield Diesels are providing *steady, dependable* power on this drill rig 40 miles northwest of Los Angeles.

Who says they are *steady* and *dependable?* They say it themselves! Just listen:

Two D17000s pull the draw works on this National No. 50 Drill Rig for Dunlap & Graham, Inc. They'd been on the job a long time when this picture was taken. One had 23,028 hours; the other, 32,039 hours!

Any oilfield diesel would be justified in faltering a few times over that long stretch. Any *ordinary* engines, that is—not Cat Oilfield Diesels! The full extent of repairs on these engines after thousands of hours of service was *one overhaul each!*

Naturally, there had been *no* repairs on the rugged Caterpillar D13000 Diesel driving the 7¼" x 10" Gardner-Denver Pump. It was a mere youngster with only 7346 hours.

Now you see why the adjectives "steady" and "dependable" are used so often with Caterpillar. And you can understand why so many drillers have decided that there is savings in numbers with Cat Oilfield Engines.

Standardize on Caterpillar. Your operators and mechanics will become familiar with one make. Parts inventory can be practically eliminated, since many engine parts are interchangeable. And you benefit from quick, reliable *one-stop* field service from *one* dealer. You get that service anywhere, day or night.

Be sure to specify Caterpillar Oilfield Engines when you repower or buy new equipment. Leading manufacturers of oilfield equipment can supply them!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

SPECIFY CAT POWER FOR HIGH-PROFIT PERFORMANCE

UNITED STATES STEEL

How to Assure Low-Cost Steel Valve Service ...in Hot Oil Handling, for example

THE INSTALLATION

In the world's largest natural gasoline and gas cycling plant at Katy, Texas, with Crane steel gate valves on absorption oil heater lines. Working pressure, 160 psi, 520 deg. F.

VALVE SERVICE RATINGS

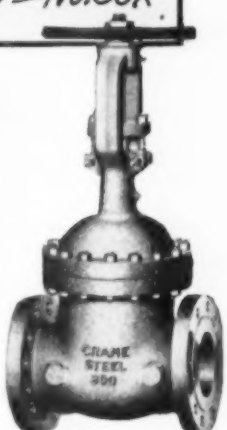
SUITABILITY:	Fully effective
FEATURES:	Crane Exelloy Trim
MAINTENANCE COST:	Nil – routine care only
SERVICE LIFE:	10 yr. plus – prolonged life assured
OPERATING RESULT:	No shutdowns for valve trouble
AVAILABILITY:	Crane Catalog item – No. 33X

THE CASE HISTORY

Installed as original equipment, these Crane No. 33X 10-inch gate valves have given continuous service since 1943. Year after year, they remain fully effective under severe conditions. They seat tightly with smooth, positive operation, yet with no maintenance other than periodic cleanout of accumulated oil sludge. Their Crane Exelloy seating surfaces show no sign of corrosive or erosive effects. They assure the plant of continued trouble-free, low-cost performance.

Obviously, valves that behave like this aren't bought on price alone. Quality is the first consideration. That's thrifty buying—the only way to get the best value.

THE VALVE



It stands apart from ordinary performance because of pioneering skill in steel casting . . . leadership in design and manufacture . . . and complete suitability for petroleum industries' process and power service needs. Choose from the widest range of body and trim materials, in all pressure classes and sizes, with flanged, screwed, or welding ends. See your Crane Catalog or Crane Representative.

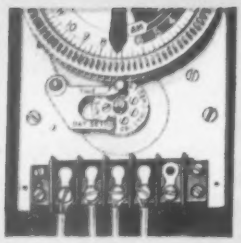
THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES · FITTINGS · PIPE · PLUMBING · HEATING

Cutler-Hammer Program Time Switch gives automatically scheduled pumping, set up easily by means of pull tabs—one for each 15 minute interval.



Day-omission feature—for non-operation any selected days of week.

Cutler-Hammer 9589 Oil Well Pumping Controller with 3 coil overload protection and time delay relay.

ONE TRIAL WILL TELL YOU
It's Genuine
Oil Country
Control

You'll only have to make a comparison *once* to see why Cutler-Hammer Oil Well Pumping Control is called *the* Oil Country Control and to see why oil men are installing it in preference to any others.

It is the outcome of a genuine, thorough and sincere contact with oil country conditions; with oil men's wishes. Not just to start, stop and protect motors and equipment successfully and dependably . . . but to meet and beat the oil country enemies of good performance . . . heat, humidity, static, dirt, dust, bugs, prevalent single phasing, sometimes careless handling.

Take a look at C-H. Note the ventilating openings that create a chimney draft to keep the "works" cool. Note the aluminum coating that bounces back the sun's rays. Note the out-in-the-open contacts that stay cooler and being "vertical," shed dust.

Note how all openings are screened, baffled, louvred to keep out dirt and dust, and bugs. See how Neoprene gasketing keeps dust out of the timer how the excess torque clock motor keeps "ticking" away even if dust gets in.

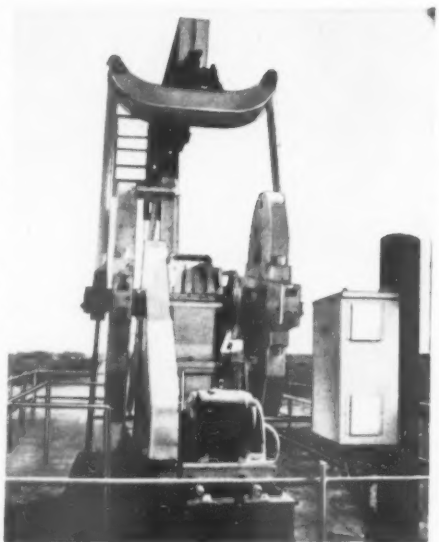
Take a look at the scheduling mechanisms, the easy on-off scheduling in 15 minute increments, the automatic day-omission feature. And there's manual or automatic restarting after an outage, either all at once or staggered starting.

Here's a popular feature too . . . optional 3 coil overload protection where single phasing is a problem; standard 2 coil where it is not a problem.

Note you don't have to rebuild or clean up the starter after a lightning arrester blows.

These are but some of the features that make this starter stand out like a derrick on a flat plain. Once you try it, you'll keep on using it.

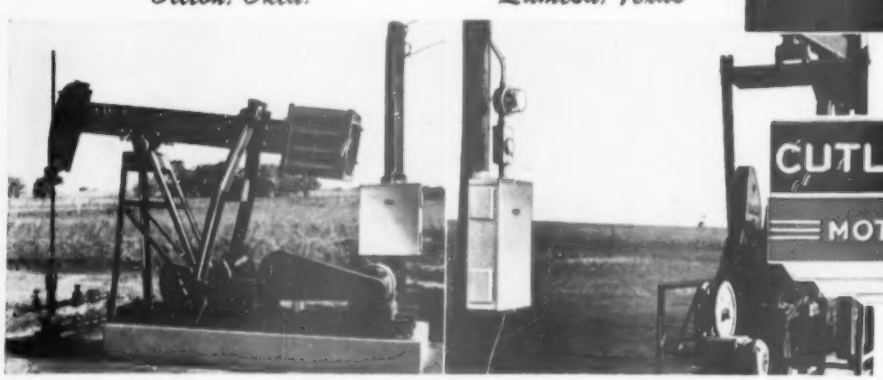
CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



Snyder, Texas

Oilton, Okla.

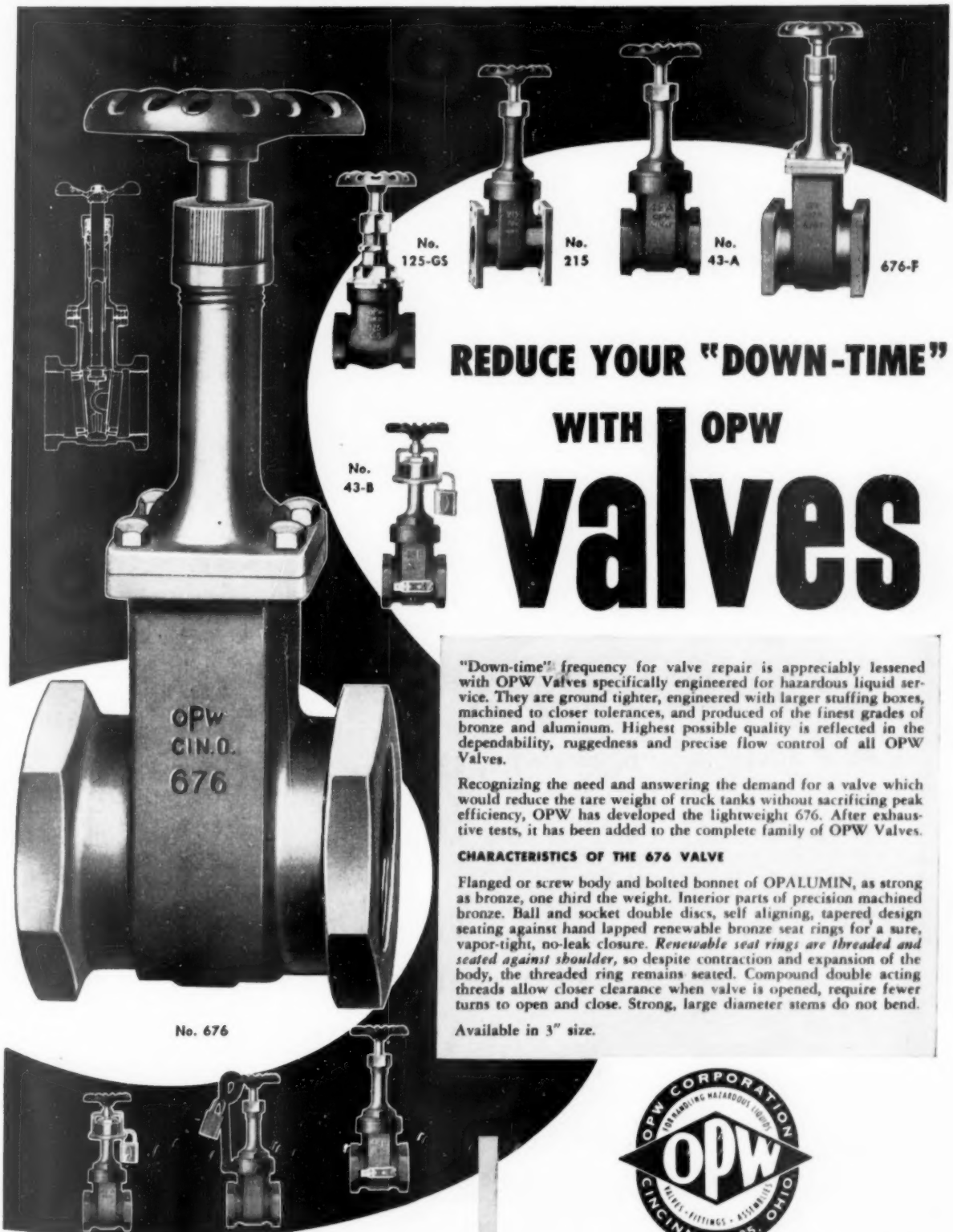
Lamesa, Texas



CUTLER·HAMMER
MOTOR CONTROL
C·H

MEMBER AMERICAN PETROLEUM INSTITUTE

UNITED STATES STEEL



REDUCE YOUR "DOWN-TIME" WITH OPW valves

"Down-time" frequency for valve repair is appreciably lessened with OPW Valves specifically engineered for hazardous liquid service. They are ground tighter, engineered with larger stuffing boxes, machined to closer tolerances, and produced of the finest grades of bronze and aluminum. Highest possible quality is reflected in the dependability, ruggedness and precise flow control of all OPW Valves.

Recognizing the need and answering the demand for a valve which would reduce the tare weight of truck tanks without sacrificing peak efficiency, OPW has developed the lightweight 676. After exhaustive tests, it has been added to the complete family of OPW Valves.

CHARACTERISTICS OF THE 676 VALVE

Flanged or screw body and bolted bonnet of OPALUMIN, as strong as bronze, one third the weight. Interior parts of precision machined bronze. Ball and socket double discs, self aligning, tapered design seating against hand lapped renewable bronze seat rings for a sure, vapor-tight, no-leak closure. ***Renewable seat rings are threaded and seated against shoulder,*** so despite contraction and expansion of the body, the threaded ring remains seated. Compound double acting threads allow closer clearance when valve is opened, require fewer turns to open and close. Strong, large diameter stems do not bend.

Available in 3" size.

GATE VALVES • EMERGENCY VALVES • CROSS CHECK VALVES • CROSS VALVES • CHECK VALVES • GLOBE VALVES • PRESSURE RELIEF VALVES • COMPRESSION CHECK VALVES • LOADING VALVES

OPW CORPORATION FOR HANDLING HAZARDOUS LIQUIDS — OPW — VALVES · FITTINGS · ASSEMBLIES — CINCINNATI 25, OHIO

OPW CORPORATION

2731 COLERAIN AVE. • CINCINNATI 25, OHIO

"You see POWELL VALVES everywhere!"

Not surprising when you realize that Powell makes more kinds of valves and has probably solved more valve problems than any other organization in the world. And this has been going on since 1846.

Wherever flow requires dependable control, there's the place for Powell Valves—available through distributors in principal cities. Made ¼″ to 30″ and 125 pounds to 2500 pounds W. S. P. Bronze, iron, steel and corrosion resistant alloys. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY

Powell Valves 108th year

UNITED STATES STEEL

ONE IS YOURS

Axelson engineers sucker rods for *specific* well conditions. Get the facts on heavy duty rods 77 and 79. They insure greater corrosion resistance, permit higher loading and give a high impact resistance and endurance limit. These, together with rods 59 and 60, satisfy every pumping condition. Axelson has the *right* rod for you.

AXELSON SUCKER RODS

AXELSON MANUFACTURING COMPANY DIVISION
LATHES: ENGINE • TOOL ROOM • HOLLOW SPINDLE • GAP BED • PETROLEUM PUMPING EQUIPMENT: DEEP WELL PLUNGER PUMPS • SUCKER RODS • HYDRAULIC PUMPING UNITS • AIRCRAFT COMPONENTS

PRESSED STEEL CAR COMPANY, INC.
RAILROAD FREIGHT CARS • STANDARD PARTS • DAIRY & FARM EQUIPMENT • WASTE CONTAINERS STAINLESS STEEL COOKWARE • CAR ACCESSORIES • TANKS • AGITATORS • SMOKE STACKS DUST COLLECTORS • COAL & ASH HOPPERS • FITTINGS & ELECTRICAL ACCESSORIES ORD NANCE MATERIEL • UNISHELTER RELOCATABLE HOMES • EXPORT ONLY: LOCOMOTIVES & TRACKWORK • CARS (MINE, ORE, CANE, INSPECTION) • UNISTRUT METAL FRAMING WEED BURNERS • BRICK & TILE MACHINERY • CANE LOADERS

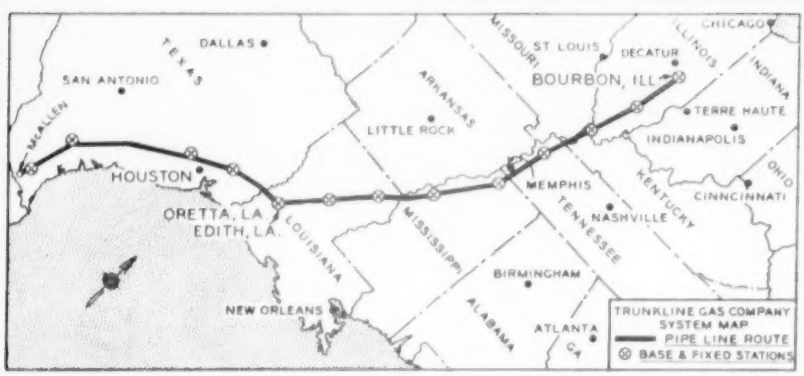
PLANTS: LOS ANGELES 54, CALIFORNIA; ST. LOUIS 14, MISSOURI.
OFFICES: NEW YORK 17, NEW YORK; TULSA 1, OKLAHOMA; BUENOS AIRES, ARGENTINA.
DISTRIBUTORS: JONES & LAUGHLIN STEEL CORP., SUPPLY DIVISION; GREAT NORTHERN TOOL & SUPPLY CO.; INDUSTRIAL AGENCIES LTD., SAN FERNANDO, TRINIDAD, B.W.I.; INDUSTRIAS WALDRIP & CAMPBELL, BARCELONA, CARACAS AND MARACAIBO, VENEZUELA; SOCIEDAD COMERCIAL DE MATERIAS PRIMAS LIMITADO, RIO DE JANEIRO, BRAZIL; ADRIAN BOLLAND & CO., AVDA. PTE R. SAENZ PENA 512, BUENOS AIRES, ARGENTINA; WELLS FARGO & CO., EXPRESS, S.A., APARTADO POSTAL 307, MEXICO, D.F.; DOMINION OILFIELDS SUPPLY CO., LTD., CALGARY, CANADA; GROSS EQUIPMENT S.A., LIMA, PERU.

WHAT'S NEW AT BRISTOL

Bristol helps him watch 1000 miles of pipeline

THREE BRISTOL METAMETER* RECEIVERS in the Houston, Texas, office of the Trunkline Gas Company, show the static and differential pressure of gas at Bourbon, Illinois, over 1000 miles away, Oretta, Louisiana, and Edith, Louisiana. Readings are sent by microwave from these points to the Bristol receivers, where even the slightest variation in flow or pressure is recorded.

*Reg. U. S. Pat. Off.



STRETCHING FROM TEXAS INTO ILLINOIS, the Trunkline Gas Company line crosses Louisiana, Arkansas, Tennessee and Kentucky. Microwave stations all along the way speed pressure readings to the Metameter Telemeters at the main office in Houston. Because they wanted the finest, Trunkline Gas selected Bristol, the acknowledged leader in telemetering, to supply the necessary recording equipment.

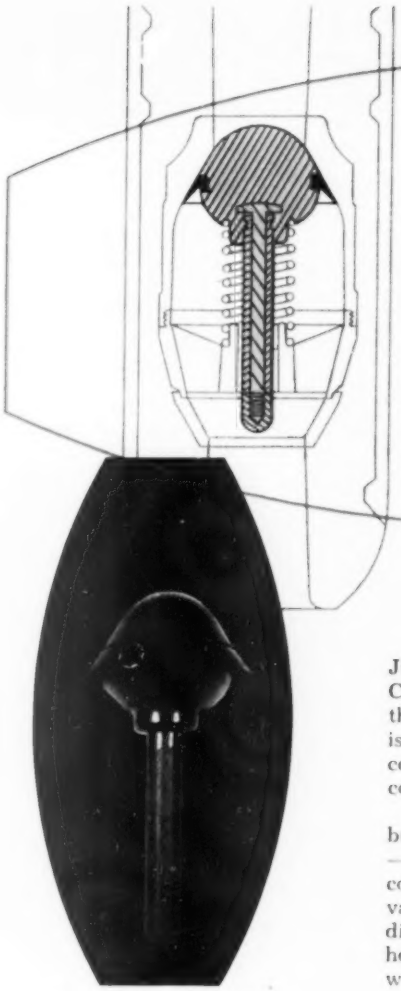
Find out how Bristol's 60 years of instrument experience can help you, too. Write for Bulletin M-1710 to The Bristol Company, 120 Bristol Road, Waterbury, Conn.

LOOK FOR OUTSTANDING NEW DEVELOPMENTS FROM BRISTOL

BRISTOL

THE DEPENDABLE GUIDEPOST OF INDUSTRY

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



no other so LEAKPROOF, WEAR-RESISTANT

HALLIBURTON'S NEW

SUPER SEAL

FLOATING EQUIPMENT

Just two words – *Super Seal* – explain why the new Halliburton Float Collars and Float Shoes are so leakproof, so wear-resistant. More so than ever before and more so than any ordinary equipment. Super Seal is your guide to greater operating efficiency even under the rugged conditions that often cause ordinary valves to leak or fail, inviting contamination from drilling fluids and cement.

The main weakness of old floating equipment was the valve, so Halliburton research started improving from the weakest point of the valve – that thin line of contact between ball and seat that was subject to concentrated stress. Continuing tests developed a new conical shaped valve that makes a wide *band* contact, allowing pressure to be widely distributed. This new valve shape can take higher pressures and heavier wear without wearing like ordinary valves. To this conical wear-resistant valve, Halliburton added a unique lip ring of oil-resistant rubber to further aid you in securing a leakproof shut-off.

These features were combined to form the Super Seal Float Valve which has proved able to take punishment far beyond any normal conditions. After hours of continuous abuse by viscous slurries and pressures up to 15,000 p.s.i., here was the result – *no damaging wear, no leakage, no fouling, and a perfect leakproof shut-off every time.* Since these results are possible under the toughest conditions, it is your assurance of super sealing performance under any conditions.

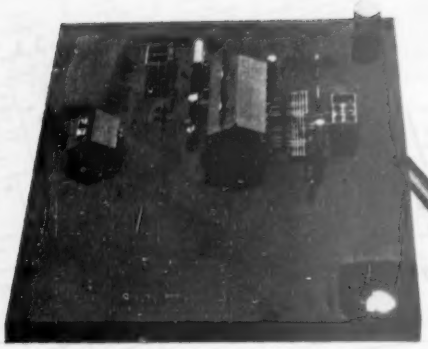
The Super Seal valve was added to the many other new improvements with the result that Halliburton Floating Equipment – always the best – is now even better than ever! Naturally, you expect these advancements to come from Halliburton – the world's most experienced cementers. So take advantage of Halliburton improvements. Let their quarter-century research and two-million-job experience serve you. Phone your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

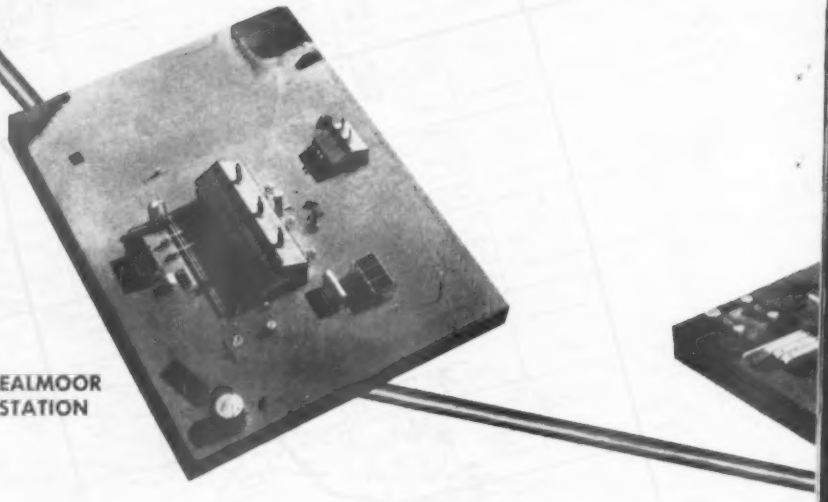
CEMENTING EQUIPMENT

THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING!

REEF FIELDS PROJECT

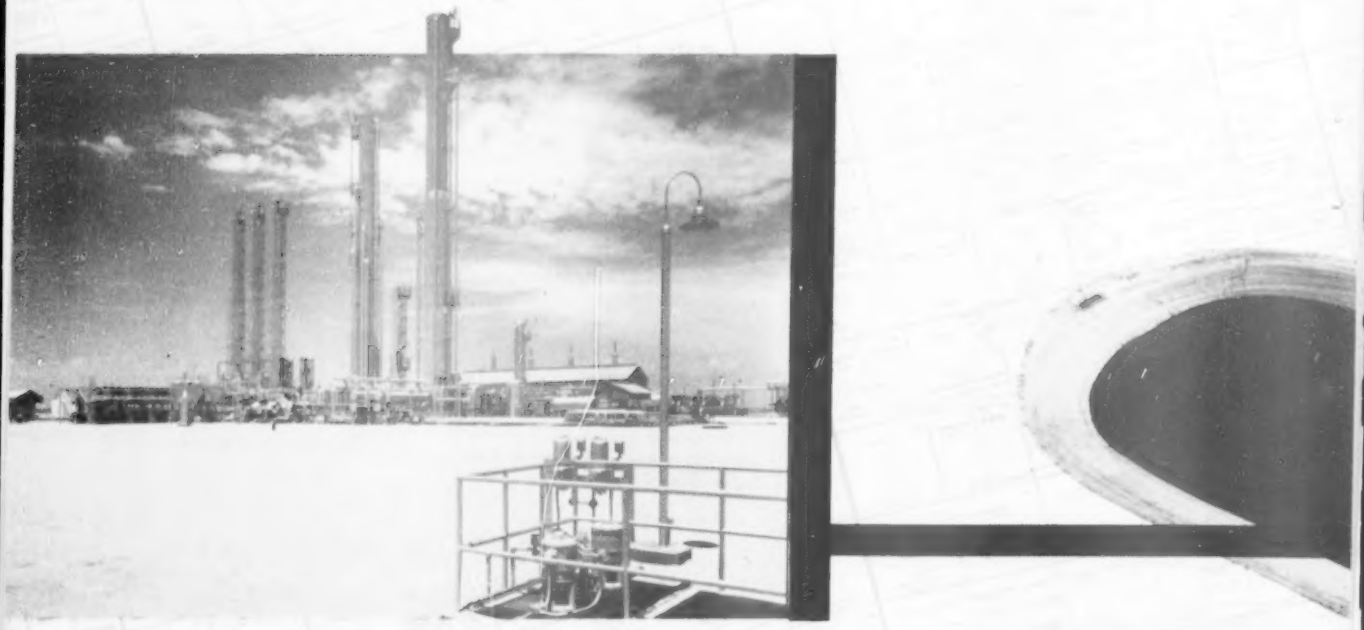


GOOD FIELD STATION



VEALMOOR STATION

Delta is proud to have had prime contract responsibility for the process facilities in the great new gas conservation project recently completed in Borden and Howard Counties, Texas, by Reef Fields Gasoline Corporation and Skelly Oil Company. Typically this Delta installation went on stream smoothly and met exacting performance guarantees comfortably. Typically, too, this Delta installation was completed expeditiously and within its assigned budget. Why not put Delta's experience to work for you? Consult us on your future plans.



. . . on stream on specification

DELTA ENGINEERING CORPORATION

ENGINEERING CONTRACTORS

DESIGNING ENGINEERING DELTA CONSTRUCTION

2121 SAN FELIPE RD. • P. O. BOX 13027 • HOUSTON, TEXAS

SET 'EM AND FORGET 'EM

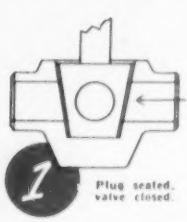
Economy note: Permanent installation — need never be replaced. Complete overhaul without removing Valve from line. Welding ends save cost of flanges.

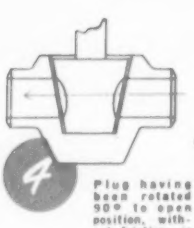
Cameron Valves

NEED NO LUBRICATION

ADVANTAGES:

- **Saves lubrication maintenance.**
- **Banishes lubricant inventory.**
- **Prevents contamination of line products and fouling of delicate measuring instruments.**
- **Does away with sticky, difficult operation.**
- **Eliminates necessity of special lubricants for special services.**





Unlike ordinary valves, Cameron valves seal tightly without lubricants of any kind. This is due to the precision-ground seat being separate from the body and, therefore, unaffected by body distortion resulting from temperatures, pressures, and line strains. Cameron valves operate with minimum effort because the plug is lifted free of the seat before turning it, thus eliminating friction.

Cameron

IRON WORKS, INC.

P. O. Box 1212, Houston, Texas

EXPORT OFFICE: 7912 EMPIRE STATE BLDG., NEW YORK CITY

IT'S JUST THAT SIMPLE. There's only one reason in the world why so many wire rope users in the oil fields prefer Roebling wire rope... *it costs less on the job than any other.*

For maximum wire rope efficiency and economy, call your nearest Roebling office for a Field Man. He'll recommend the best ropes for your operations... District Offices at Cleveland, Denver, Houston, Los Angeles, Odessa, Tulsa.

ROEBLING CF&I

A subsidiary of The Colorado Fuel and Iron Corporation

THERE IS A ROEBLING DISTRIBUTOR NEAR YOU

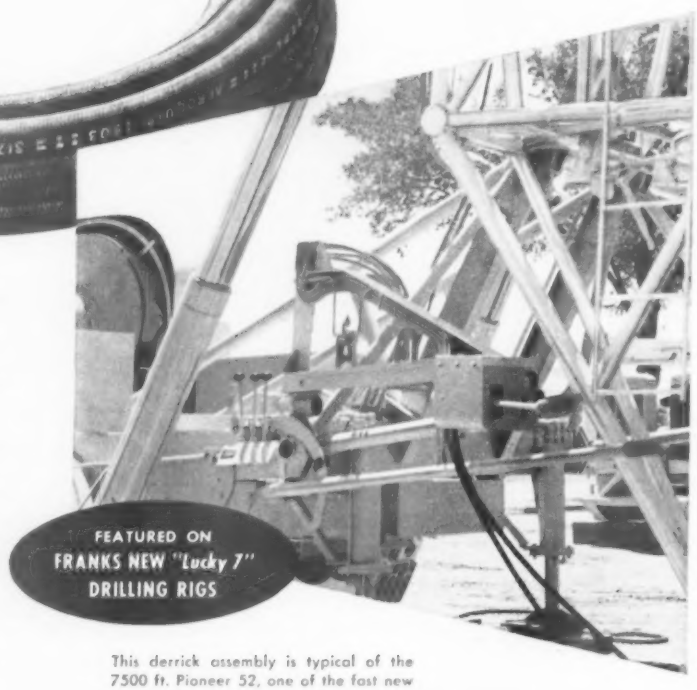
Aeroquip Flexible Hose Lines are the Choice of Franks Mfg. Corp.

DETACHABLE, REUSABLE FITTINGS CUT USER INVENTORIES AND DOWNTIME

Aeroquip Means Top Quality. Aeroquip hose and fittings are made to the highest standards in the industry. Equipment manufacturers can offer no greater evidence of quality than the Aeroquip Trade Mark that appears on every hose line.

Aeroquip Means Quick Replacement. With Aeroquip, hose line replacements can be made right in the field by cutting bulk hose to required length and attaching the reusable fittings. No special tools are needed. Hose and fittings are *matched* for guaranteed performance.

Aeroquip Means Quick Availability. Aeroquip is the world's leading producer of hose lines for industrial and aircraft applications. A nation-wide network of distributors and factory sales offices stands ready to serve you at all times. Your inquiry is invited.



This derrick assembly is typical of the 7500 ft. Pioneer 52, one of the fast new "Lucky 7" drilling rigs featured by Franks Mfg. Corp. The derrick is raised and extended by a hydraulic system that utilizes Aeroquip Flexible Hose Lines.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

SALES OFFICES: Burbank, Calif. • Dayton, Ohio • Hagerstown, Md. • High Point, N. C. • Miami Springs, Fla. • Minneapolis, Minn. • Portland, Ore. • Van Wert, Ohio • Wichita, Kan.
IN CANADA: Prenco Progress and Engineering Corporation Ltd., Toronto • IN ENGLAND: Super Oil Seals & Gaskets, Ltd., Birmingham

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

MORE ...FOR LESS

Tretolite products and services are designed to assure just that, more for less.

TRETOLITE COMPANY
Tret-O-litE
SAINT LOUIS · LOS ANGELES

Tret-O-lite dehydrating chemicals reduce the BSandW content of emulsified crudes to minimum, rapidly and economically. Tretolite service engineers are active wherever oil is produced, to help producers get more dehydrating efficiency from less dehydrating chemical.

TRETOLITE COMPANY
KONTOL
SAINT LOUIS · LOS ANGELES

Kontol corrosion preventives increase the useful life of pumps, rods, tubing and casing by preventing corrosion damage. Your Tretolite service engineer will help you apply Kontol so you get more equipment life, with fewer equipment failures, at minimum expense.

When we state that you get more for less when you specify Tretolite products and services, we do not mean to boast. We have the experience, the research program and the engineering staff to see to it that you do.

If you have a production problem involving dehydration, corrosion, scaling, paraffin or stream pollution, write or call.

TRETOLITE COMPANY

A DIVISION OF PETROLITE CORPORATION

3515 Telegraph Road, Los Angeles 22, California

369 Marshall Avenue, St. Louis 19, Missouri

Chemicals and Services for the Petroleum Industry

DEHYDRATING • DESALTING • CORROSION PREVENTION
PARAFFIN REMOVAL • WATER DE-OILING • SCALE PREVENTION

TKF 54-2

Do you have this MARVEL Inverse Oiler on your { GASOLINE / BUTANE / or / DRY GAS } engine?

then you should use this MARVEL MYSTERY OIL in the Oiler!

Here's a carefully engineered pair to improve performance of any engine . . .

The *Marvel Inverse Oiler* is designed to feed *Marvel Mystery Oil* in exact proportion to engine speed and load. Prevents excess wear on valve stems and guides . . . keeps upper piston rings free to move in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakage. In addition, *Marvel Mystery Oil* reduces cylinder wall wear, and gives assurance against valves sticking. Remember, it is *the oil* which must do these things and only *Marvel Mystery Oil* is blended for this purpose and for this oiler. Over 30 years of exceptional performance.

This Chart shows the proper setting for constant load engines

BRAKE H. P. AT BELT	NAT. GAS CU. FT. PER HOUR	BUTANE GALLONS PER HOUR	GASOLINE GALLONS PER HOUR	M. M. OIL DROPS PER MIN.	M. M. OIL HOURS PER QUART
10	115.	1.07	1.12	4	228
15	172.5	1.60	1.68	6	152
20	230.	2.14	2.24	8	114
25	287.5	2.67	2.80	10	91
30	345.	3.21	3.36	12	76
35	402.5	3.74	3.92	14	65
40	460.	4.28	4.48	16	57
45	517.5	4.81	5.04	18	50
50	575.	5.35	5.60	20	45
60	690.	6.42	6.72	24	38
70	805.	7.49	7.84	28	32
80	920.	8.56	8.96	32	28
90	1035.	9.63	10.08	36	25
100	1150.	10.70	11.20	40	22
120	1380.	12.84	13.44	48	19
140	1610.	14.98	15.68	56	17
160	1840.	17.12	17.92	64	14
180	2070.	19.26	20.16	72	12
200	2300.	21.40	22.40	80	11
225	2587.5	24.00	25.20	90	10
250	2875.	26.75	28.00	100	9
275	3162.5	29.42	31.10	110	8
300	3450.	32.10	33.60	120	7

EXAMPLE:—If you use 805 cu. ft. of dry gas, 7.49 gallons of butane or 7.84 gallons of gasoline, your H.P. is about 70, so adjust oiler to feed 28 drops per minute. You will then receive about 32 hours per quart of MARVEL MYSTERY OIL.

If engine load increases after setting for normal load, oiler will automatically increase its feed, or decrease its feed when load is lessened.

When more than one oiler is used

To determine drop count per oiler when more than one oiler is used on an engine—divide recommended drop count by number of oilers.

NOTE: Guarantee on oiler is void if any other oil than MARVEL MYSTERY OIL is used therein. Some *engines* also carry this guarantee policy.

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO. Dept. 373, 242 West 69th Street, New York 23, N. Y.

A Familiar Name in the OIL COUNTRY

"Buy From Bovaird"

TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT...

OFFICES AND STORES

ILLINOIS—Clay City, Grayville, Salem
KANSAS—Chase, Great Bend, Liberal, Pratt, Russell, Wichita
NEW MEXICO—Lovington
OKLAHOMA—Duncan, Oklahoma City, Pauls Valley, Sapulpa, Seminole, Tulsa
TEXAS—Borger, Dallas, Houston, Midland, Odessa, Pampa, Snyder

PESA
PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION
PARTNERS IN PETROLEUM PROGRESS

THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

83 YEARS OF PROGRESS WITH THE OIL INDUSTRY

Fractions
SOLVE BIG PROBLEMS

The petroleum industry has made good use of the "divide-and-rule" formula that conquered kingdoms . . . to win command of the giant powers hidden in nature's oil. The industry's process engineers have transformed American life by their mastery of petroleum's secrets . . . and fractionating has been their master key.

These engineers' ability to develop processes which break petroleum into its component fractions has harnessed the "black gold" into a myriad forms of service. There have been other important results, too. The gigantic motor industry . . . America's vast network of modern highways . . . the services to motor travel—these are largely by-products of the petroleum process engineer's knowledge of fractional distillation.

For many years, Sun Ship has been adding to its own prestige by the service and cooperation its great shops give to the petroleum industry, and to the many other industries which call on Sun Ship's versatile engineering and construction skills. It has built . . . for chemical and petroleum process engineers, and for refineries throughout the world . . . the immense fractionating towers, pressure vessels, special machinery and heavy equipment they require. The 95'7" crude tower shown in the photograph, ready for shipment, is a representative example.

Sun Ship's services will continue to keep pace with the giant strides made by the nation's industries in the engineering progress which is steadily building a greater America.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE SINCE 1916 CHESTER, PA.

25 BROADWAY • NEW YORK CITY

MATHIESON INDUSTRIAL SULPHURS

REFINED ROLL BRIMSTONE

Sticks, 1¾" dia. broken lengths
99.9-100% pure
400-lb. barrels
150-lb. burlap bags

LILY BRAND

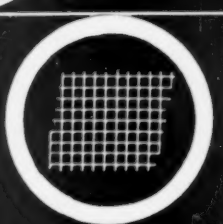
Sublimed flowers U.S.P.
Refined fluffy powder
165-lb. barrels
100-lb. osnaburg bags with paper liners inserted

MULE BRAND

Ground commercial flour
99.5% min. purity
90% passing 80 mesh
240-lb. barrels
50-lb. triple-wall paper bags

RED WING BRAND

U.S.P. ground refined sulphur
200- & 250-lb. barrels
100-lb. lined burlap bags



GRANULAR SULPHUR

Crude granular sulphur
8 or 16 mesh
99.5% min. purity
50-lb. triple-wall paper bags

In addition to the above, Mathieson also offers a full line of regular, conditioned and oil-treated sulphurs for the rubber industry. For complete information see your Mathieson representative or write today.

MATHIESON

MATHIESON CHEMICAL CORPORATION
Mathieson Industrial Chemicals Division
Baltimore 3, Maryland

caustic soda • soda ash • chlorine • sulphur • sulphuric acid • bicarbonate of soda ammonia • sodium nitrate • nitric acid • sodium methylate • sodium chlorite • alum hypochlorite products • dry ice and carbonic gas • ethylene glycols and oxide • methanol

2295

More good J&L news . . .

PACKINGS BY U.S. RUBBER!

IDECO was recently added to the J&L line because we believe it to be the best drilling equipment made.

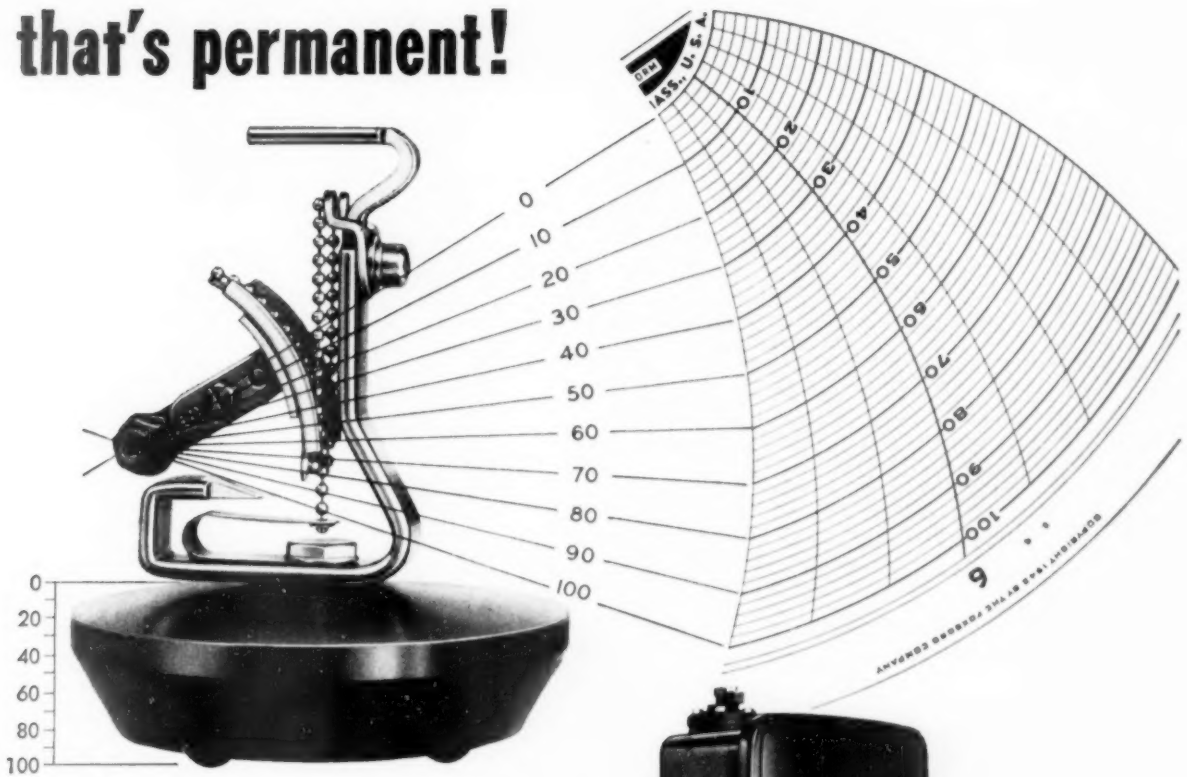
We have joined hands with the United States Rubber Company for the same reason. The various types of U. S. packing designed for drilling and refining do an outstanding job. Try them! There is no duplication in the U. S. line. This saves confusion, space, and money. There are highly specialized types, of course, but you can handle about 90 per cent of your normal requirements with the types of packing shown on this page. Count them – they are called the U. S. PREFERRED ELEVEN.

J&L STEEL

"...here's MY warehouse!"

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION —— TULSA
Serving The United States and Canada

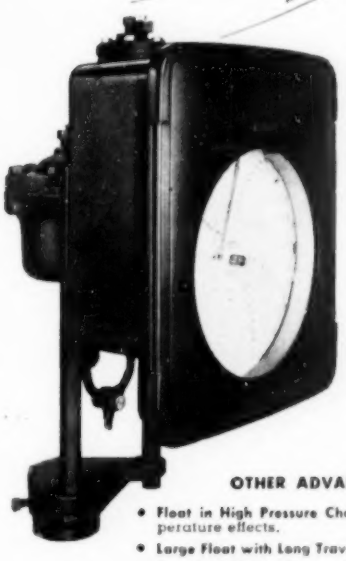
Full-scale meter accuracy that's permanent!



Exclusive Segmental Lever Design Gives Linear Transmission from Float to Pen Point . . . No Angularity Errors

A basic-design feature of Foxboro Flow Meters insures permanent calibration at all readings on the scale, by eliminating angularity errors and lost motion. The exclusive Segmental Lever drive transmits vertical motion of the float to the pen in positive, linear relationship. Its stainless steel ball chain runs free and true, regardless of meter alignment.

This is only one of several better-engineered features that have made Foxboro Flow Meters the unqualified choice of industries wherever dependability and "cash-register" accuracy of metering are important. Available in rectangular and circular case models. Write for complete story in Bulletin 460. **The Foxboro Company, 604 Neponset Avenue, Foxboro, Massachusetts, U.S.A.**



OTHER ADVANCED FEATURES

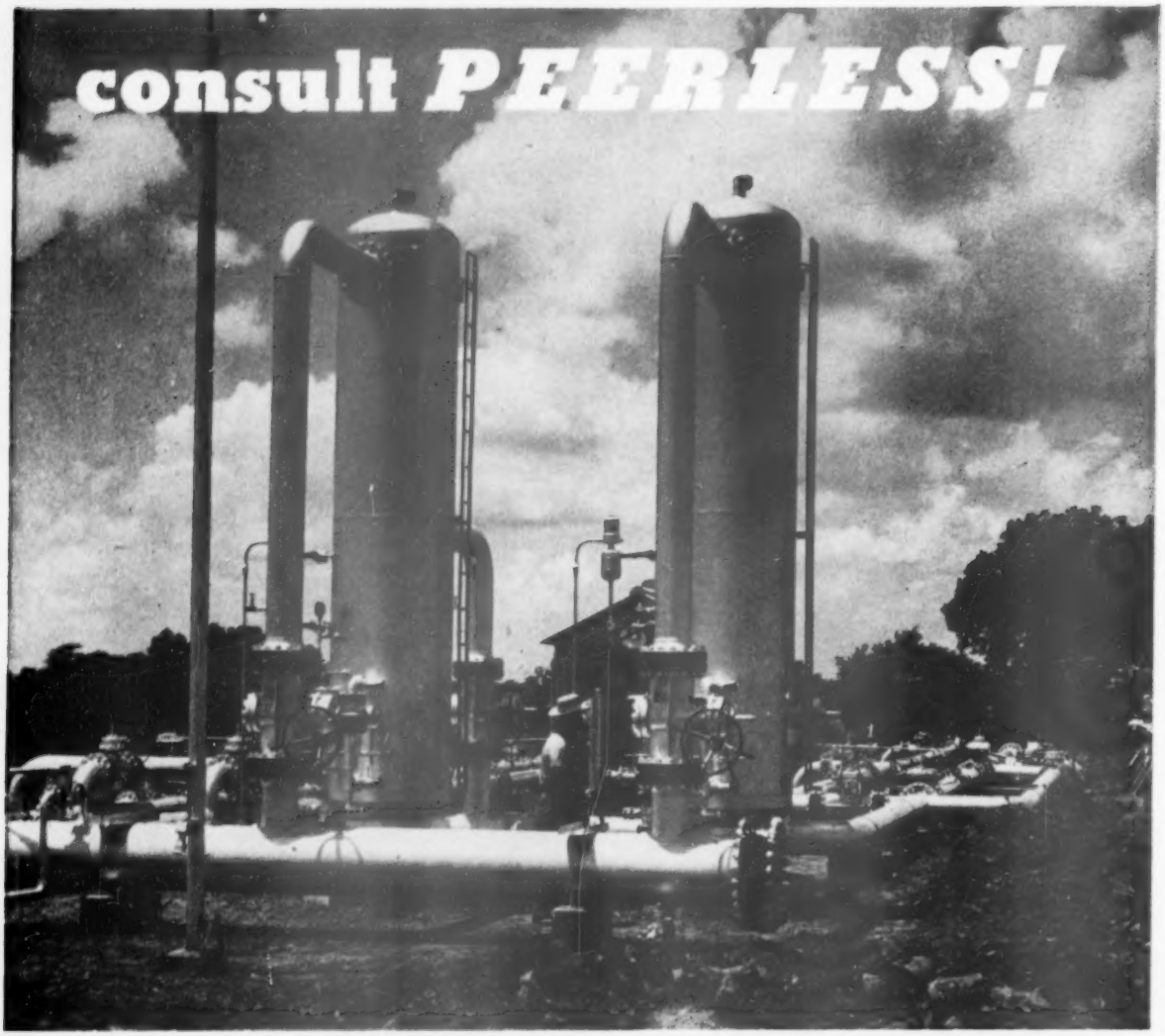
- **Float in High Pressure Chamber** minimizes ambient temperature effects.
- **Large Float with Long Travel** gives high power pen drive.
- **Sure-Seal Check Floats** with positive-seating ball plugs submerged in mercury prevent sticking, leaking, corrosion. Will not blow mercury.
- **Pressure Seal Bearing** is friction-free, completely leakproof, interchangeable. No stuffing box. No lubricator.
- **Self-aligning, Union-Coupled U-Bend** — No gaskets. Fully-adjustable plug gives calibrated damping, directed drain.

OVER 100,000 FOXBORO FLOW METERS WITH SEGMENTAL LEVER ARE IN USE TODAY

FOXBORO REG. U. S. PAT. OFF. — **First in FLOW METERS**

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

For GAS SCRUBBERS



The **BEST SCRUBBERS** for PIPELINES, GATHERING SYSTEMS, COMPRESSOR STATIONS, PLANT INLET SCRUBBERS

Pictured is an installation of TWO 42" x 15' Peerless Gas Scrubbers, at a new Pipeline Compressor Station, in Louisiana. This installation is typical of the many successful applications of Peerless Scrubbers.

Each Peerless Scrubber is designed and built around the famous Peerless Mist Extractor Unit, which guarantees the liquid entrainment loss to be less than 1/10 gallon per million standard cubic feet of flowing gas.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 7193 ★ DALLAS, TEXAS ★ DIxon-8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

AVONDALE *and* the OIL Industry

SERVICE • INTEGRITY • EFFICIENCY

SHIP BUILDING • SHIP REPAIRING • FOUNDERS • PROPELLERS • STRUCTURAL STEEL

AVONDALE MARINE WAYS, INC.

CABLE ADDRESS "AVONWAYS"

P. O. BOX 1030 • PHONE UNiversity 4561 • NEW ORLEANS 8, U. S. A.

The leader has lengthened its lead!

From the day it was announced, the Marsh Mastergauge took the lead in the pressure gauge field. You are probably well aware of this . . . but do you realize that we have constantly given it plus qualities to still further *lengthen* its lead?

Look at the recent developments presented opposite. Unquestionably these are the three greatest strides in gauge development since the creation of the Marsh "Recalibrator."

Yes, the three basic gauge components have been brought to a remarkable stage of perfection in the Mastergauge. Certainly, for every critical service there is no gauge to compare with it!

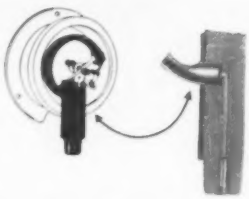
Mastergauge is standard bearer for the world's broadest line of gauges and dial thermometers, each the best of their kind in the applications for which they are recommended. Ask for data covering your specific needs.

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corporation*
Dept. L., Skokie, Ill.

ONLY MARSH HAS THE "RECALIBRATOR"

MARSH

THE STANDARD OF ACCURACY

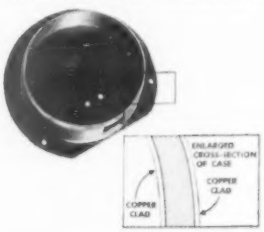


1—A better tube construction—

The Mastergauge always had the most effective joining of the bourdon tube to the socket . . . but . . . *one-piece construction is always better!* Welding these dissimilar parts posed a tough problem . . . but we finally solved it by a new process—the "Conoweld" process—exclusively ours. The photo of an actual section shows the perfect fusion. Socket, tube—even the end-piece—are fused into one leak-tight unit.

2—A better movement—

To convert the action of the bourdon tube into accurate pressure indication, the gauge movement must be rugged, practically frictionless, highly resistant to corrosion. A self-lubricating effect is achieved in the Mastergauge movement by using alternate stainless steel and monel—gears stainless, bushings "K" monel, and so on. A distinguishing feature is the "coined" sector gear. Note broad face of gear which results from this coined extrusion.



3—A better case—

Another development that has increased Mastergauge leadership is the new copper-clad, wrought steel case. The case has the strength of steel and the resistance to corrosion of copper. It is four times as strong as a cast iron case and one-third lighter. Final finish is a handsome corrosion resistant black enamel. Every case is fitted with Marsh safety blow-out plug—a typical advancement.

"I'm squeezed by tight schedules

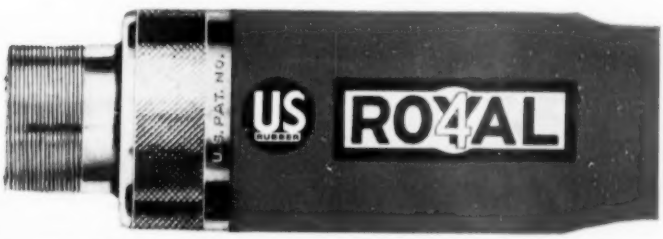
...I've no time for switching hose; the *same* one's got to stay on from spud to pay."

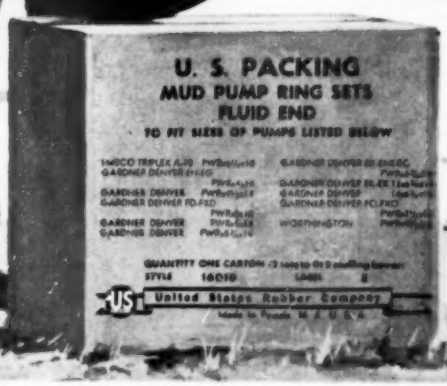
says "Red" Royal

And that's why toolpusher "Red" insists on U.S. Royal 4 Rotary Hose. He doesn't have to run into downtime by *switching* to standby hose for high pressures. U.S. Royal 4 will handle the heaviest pressures delivered by today's pumps—with plenty to spare. And unlike standby hose, it needs no lubrication.

Ask your local "U.S." Supply Store about U.S. Royal's service records, no matter where the oil field. Here is the hose that will help you avoid keeping expensive equipment idle.

"Red" Royal also recommends U.S. Matchless® mud pump vibrator hose between standpipe and mud pump. Does away with broken pipe and loose connections, stands up under highest pressures.





Developed by Science—
Proved by Drillers

Available in all FIELDS at SUPPLY STORES

US RUBBER

UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Down

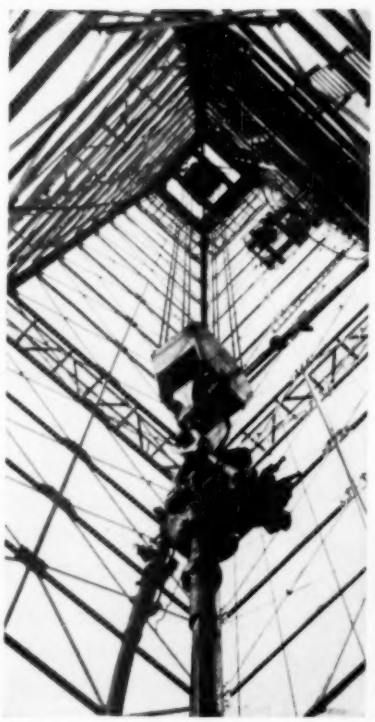
11,000 feet with Tiger Brand Wire Lines

WHEN these pictures were taken, Kelly Drilling Co., of Houma, La., was drilling at more than 11,000 ft. on the Atchafalaya River. They had gone all the way with Tiger Brand 1⅜" 6x19 Seale Monitor Improved Plow Steel Excellay Drilling Line, with independent wire rope core.

This line is specially designed for tough rotary drilling jobs. It is made of Monitor Steel—the strongest, toughest, most wear resistant of the standard grades of steel used for wire rope. Excellay preforming reduces the tendency of the line to whip or kink, increases fatigue resistance, and assures smooth spooling. The independent wire rope core gives this line extra strength and resistance to crushing.

Specify Tiger Brand Excellay Preformed Monitor Wire Lines for *your* rigs. They assure you plenty of good service and easy handling. They come in all sizes, for all types of rigs, with either a fiber core or independent wire rope core.

If you have any question about wire line, get in touch immediately with an American Wire Rope Representative. Just call your distributor.



The derrick on this big barge rig rises 194 ft. above the surface of Atchafalaya River in Louisiana. Tiger Brand 6 x 19 Rotary Drilling Line is giving good service on this tough drilling job.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

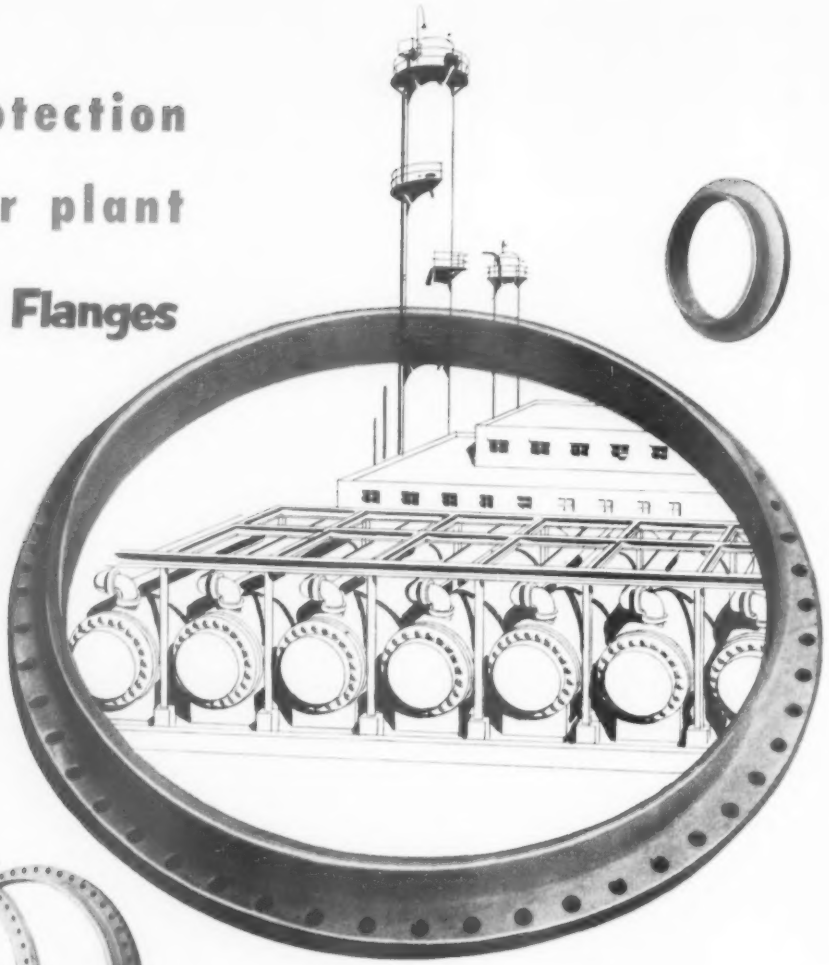
U·S·S AMERICAN TIGER BRAND WIRE ROPE

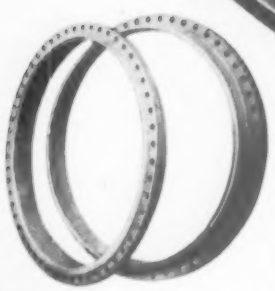
Excellay Preformed

UNITED STATES STEEL

rings of protection around your plant

Railway Steel Flanges





For brake rims, gear blanks, sheave rings and circular sections (forged and rolled seamless) of many types, specify "Railway." To assure highest dependability in the finished products, we make the high quality steels in our own plant.

Install large-diameter Railway Steel flanges on your heat exchangers, pressure vessels and piping and you can be sure of maximum protection.

Made from carbon and alloy steels to all recognized American standards, Railway Steel flanges come in standard or special types, all sizes, ranging from 18 in. ID to 150 in. OD.

For full information, call our sales representative in Chicago, Cleveland, Houston, New York, Richmond, San Francisco, St. Louis, St. Paul or Tulsa.*

*Ardyn Supply Company

Railway Steel Flanges

AMERICAN LOCOMOTIVE COMPANY

24 ACRES *Cover the World*

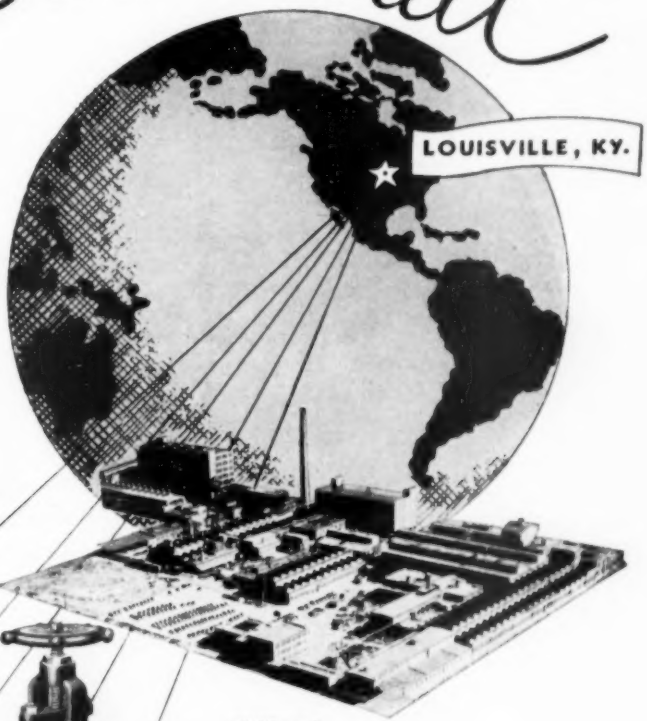
. . . with TOP QUALITY

DROP FORGED STEEL

VALVES, FITTINGS and FLANGES

by

Vogt



Air View of
Henry Vogt Machine Co.

This 24 acre Vogt plant supplies the most comprehensive line of top quality *drop forged* steel piping materials anywhere available to industry. That's why they're the choice of leading refineries, power plants, chemical plants, etc., the world around!

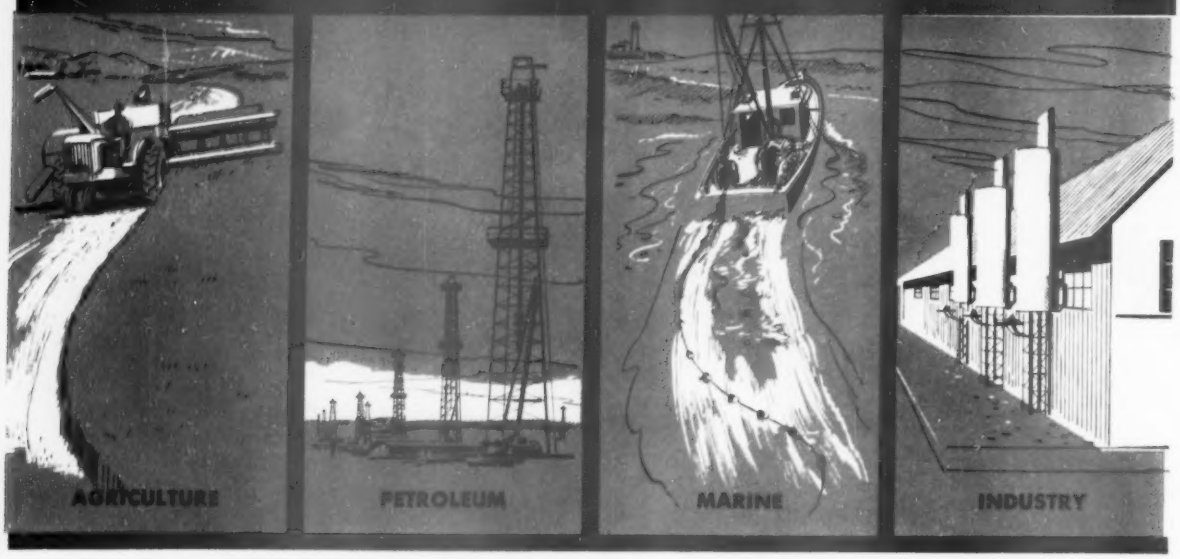
OUR COMPLETE LINE INCLUDES

Flanged, Screwed and Socket Weld End Globe, Gate and Check Valves • Ells, Tees and Crosses • Couplings • Bushings • Plugs • Unions • Flanges and Flange Unions • Welding Heads

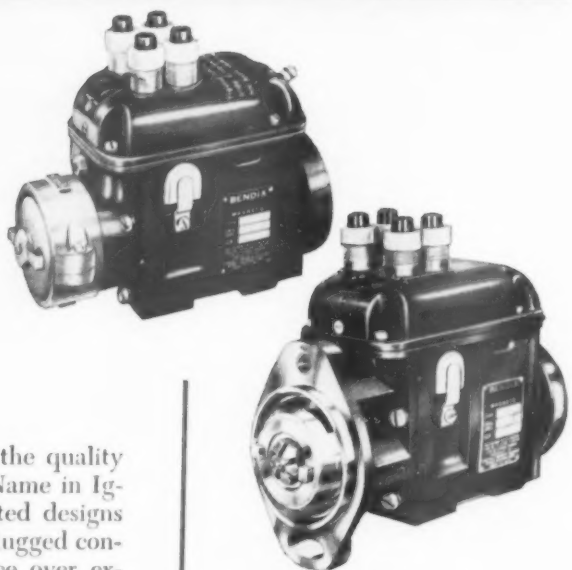
HENRY VOGT MACHINE CO. LOUISVILLE 10, KY.

Branch Offices: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

For a **wide** variety of applications . . .



specify Bendix PA and PAF series magnetos



Here in the PA and PAF series magnetos, built to the quality standard that has made Bendix—The Most Trusted Name in Ignition—are a wide variety of base and flange mounted designs for agricultural, petroleum, marine or industrial use. Rugged construction throughout assures trouble-free performance over extended periods of time.

Detailed information available on request.

OUTSTANDING FEATURES: ***Aircraft Quality • Full Ball Bearing Weatherproof • Metal Distributor Cover • Shielded High Tension Outlets • Pivotless Aircraft-Type Breaker • Adjustable Lag and Lug Position • Unexcelled For High Speeds • Lower Maintenance Cost • These Features Assure Long Trouble-Free Operation.***

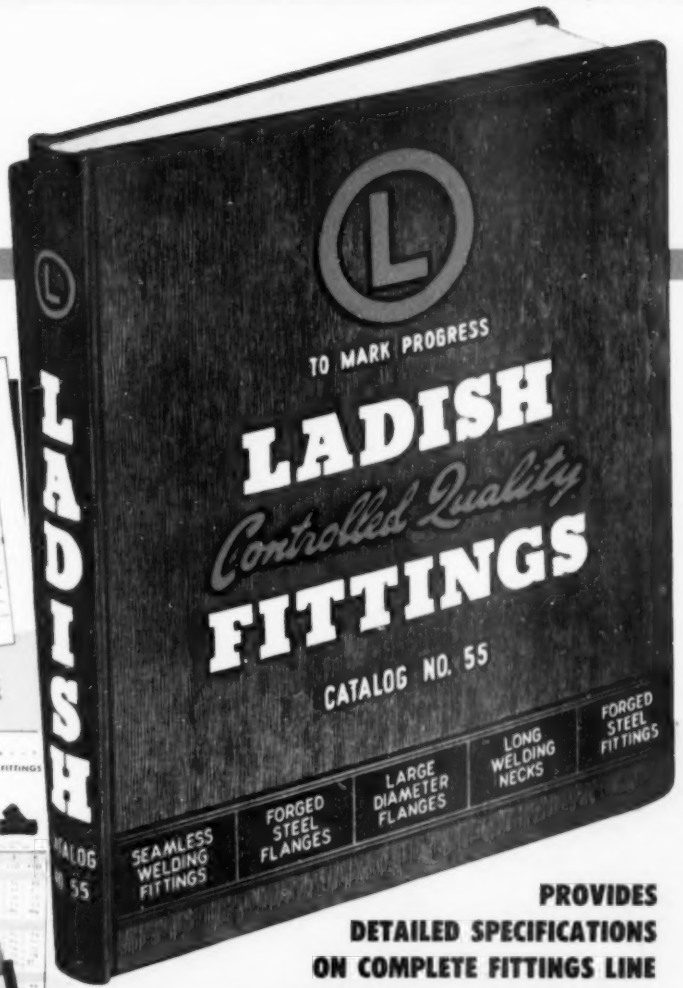
SCINTILLA DIVISION
OF
Bendix
AVIATION CORPORATION
SIDNEY, NEW YORK

Bendix

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

FACTORY BRANCH OFFICES: 117 E. Providencia Ave., Burbank, Cal. • Brouwer Bldg., 176 W. Wisconsin Ave., Milwaukee, Wis. • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Mich. • 512 West Ave., Jenkintown, Pa. • 8401 Cedar Springs Rd., Dallas 19, Tex. • American Bldg., 4 S. Main St., Dayton 2, Ohio

SEND FOR YOUR NEW
304-PAGE LADISH
FITTINGS CATALOG NOW



PROVIDES
DETAILED SPECIFICATIONS
ON COMPLETE FITTINGS LINE
...PLUS USEFUL TECHNICAL DATA

Here are detailed dimensions, weights and specifications to assist in selecting proper fittings for any application... plus useful engineering and technical data. Major sections include:

68 PAGES BUTT WELDING FITTINGS
Available in Standard through Double Extra Strong weights... in sizes ½ through 42 inches.

56 PAGES FORGED STEEL A.S.A. FLANGES
Available in 150 through 2500-pound pressure ratings ...in sizes ½ through 24 inches.

20 PAGES LARGE O.D. AND T.E.M.A. FLANGES
Available in a complete range of types and pressure ratings... in sizes up to 160 inches in diameter.

7 PAGES LONG WELDING NECK FLANGES
Available in 150 through 2500-pound pressure ratings ...in sizes from 1 through 24 inches.

5 PAGES FORGED WELDLESS ROLLED RINGS
Available in diameters up to 240 inches in a wide variety of forged contours...in weights up to 40,000 pounds.

20 PAGES FORGED STEEL FITTINGS
Screwed and Socket-Welding types in 2000 through 6000-pound pressures, sizes ⅛ through 4 inches.

12 PAGES STAINLESS AND ALLOY FITTINGS
Featuring data on properties of materials and a comprehensive table of piping specifications.

56 PAGES TECHNICAL DATA TO SIMPLIFY PIPING DESIGN PROBLEMS

MAIL THIS COUPON TODAY FOR YOUR LADISH CATALOG

LADISH CO.
Dept. OGJ, Cudahy, Wisconsin

Please send me, without cost or obligation, the new 304-page Ladish Fittings Catalog No. 55.

Name

Title

Company

Address

City Zone State

Handclasp of a friend-in-need

There's confidence in the very "feel" of the world famous C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers. The quick-acting "Squeez-Grip" fits your hand naturally like a handclasp... hangs right... carries right... works right. You're in complete command of the situation instantly... no fumbling... no fatigue.

From the non-conducting, shatterproof discharge horn to the high strength, durably finished cylinder, you get top quality construction that results in a lifetime of satisfactory service. Because of the very few working parts and corrosion resistant materials throughout, the total cost to you over the years is less than other initially lower priced makes... fire after fire, recharge after recharge, without trouble.

It's not hard to see, when you fully compare and try, why C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers are your best buy for killing flammable liquid and electrical fires, as well as some surface fires involving ordinary combustible materials. Sizes range all the way from 2½ to 100 pounds capacity... all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories, Armed Forces and Government Bureaus.

With C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers the penetrating carbon dioxide is a clean, dry, non-damaging, non-conducting, inert gas... smothers fire instantly, leaves no after fire mess... harmless to equipment, materials and finishes... even food is still perfectly edible.

Act now for complete free information on these first-rate, sure-acting fire extinguishers. Remember fire doesn't wait ...get the facts today!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-in Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

FISHER...

AUTOMATIC CONTROLS
STOCKED BY

VINSON

FOR

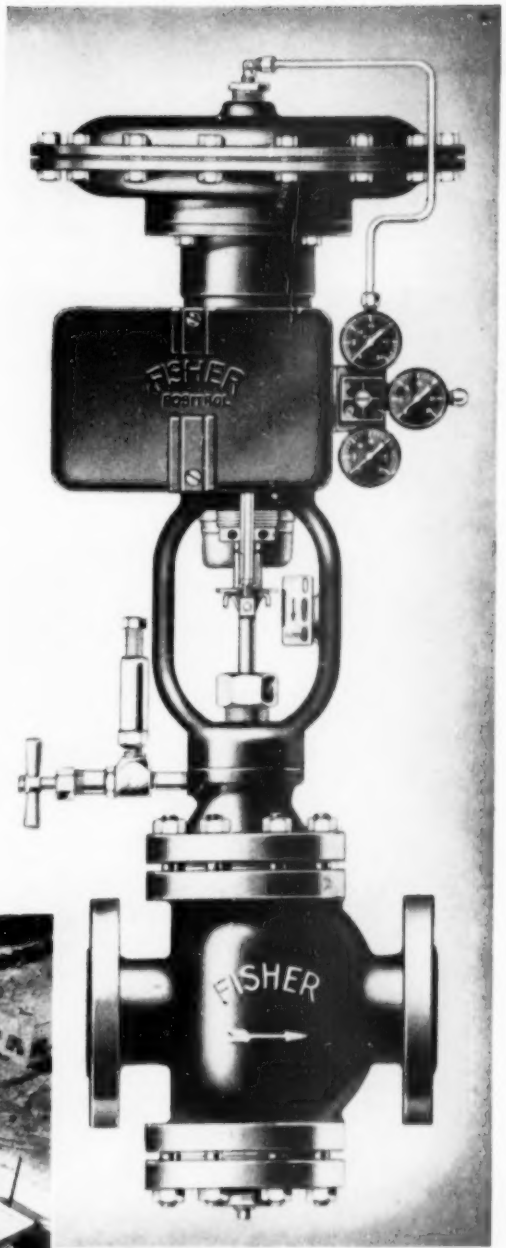
Oil Refineries • Gasoline Plants • Oil Production • Gas Distribution Systems • Power Plants • Related Industries

The Fisher Governor Company is the world's largest manufacturer of control equipment. To back up these tremendous production facilities Vinson Supply Company carries large stocks at Tulsa, Dallas, Odessa and Amarillo.

Call Vinson to take care of your control problem from inception to final servicing.

OTHER VINSON LINES

Crane Valves • Nordstrom Valves • Ladish Welding Fittings and Flanges • Chase Brass Condenser Tubes • National Pipe and Steel Tubes



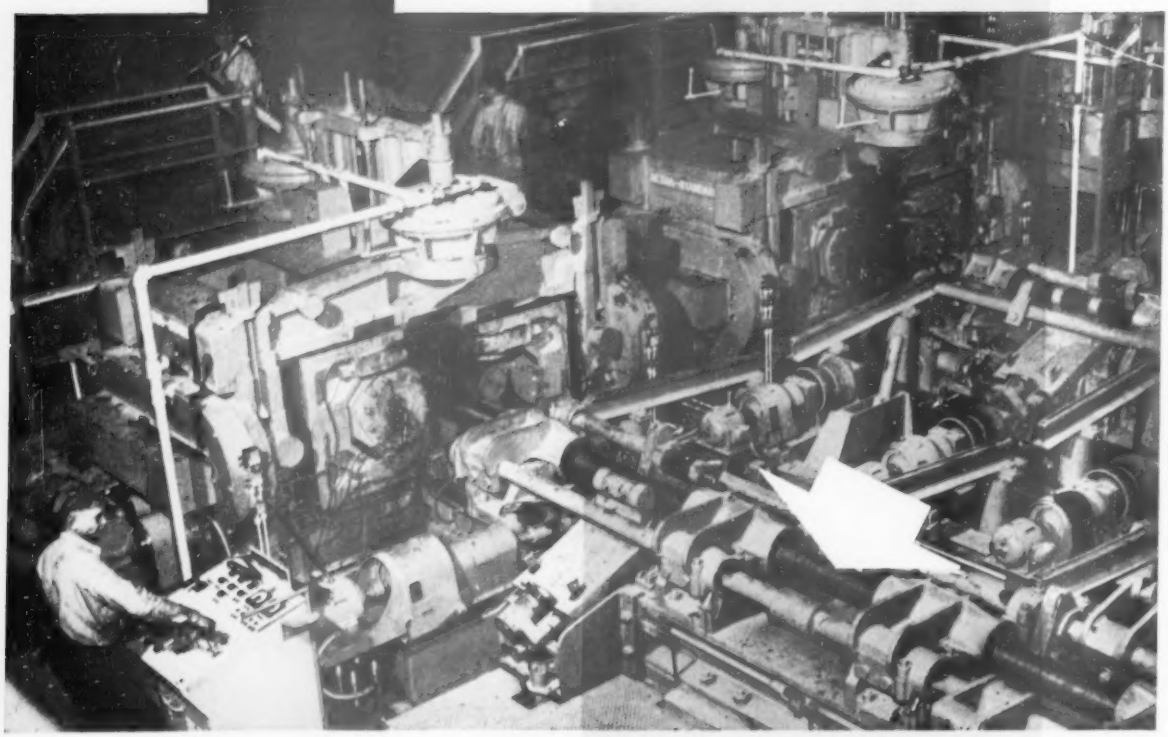
Vinson • Dallas

Vinson Supply COMPANY

TULSA • DALLAS
ODESSA • AMARILLO

making a well-rounded product

at the CF&I **SEAMLESS TUBE MILL**



Quality controlled from blast furnace to finished product, CF&I Seamless Oil Country Tubing and Casing are the result of the most modern fabricating facilities and advanced technological improvements.

Here, at our recently constructed Seamless Tube Mill in Pueblo, Colorado, a shell from the plug rolling mill is shown emerging from one of the reeler mills where the tube has been rounded and burnished inside and out. From this stage of production the tube is ready for reduction to accurate size by the sizing rolls.

CF&I Seamless Oil Country Tubing and Casing meet API STD 5A specifications and are available in sizes from 2⅜" O.D. through 9⅝" O.D.

CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

DENVER, COLORADO

2286

AVAILABLE JOHNSTON by AL CAPP

IS YO' AVAILABLE JOHNSTON?
YAS'M—AH IS AVAILABLE—BUT STRICTLY FO' TESTIN' OIL WELLS, PRACTIC'LY ANYWHAR!!—AN' BY TH' TIME TH' PIPE IS PULLED!! US JOHNSTONS HAS 73 SERVICE OFFICES!!
DOES YO' WORK FAST?
YAS'M!!—BUT STRICTLY IN MAKIN' TESTS WIF A MINNY-MUM OF LOST DOWN TIME!!
DON'T YO' TEST ANY-THING BUT OIL WELLS?
NOPE!! —THASS OUR SPESHULTY!! —THASS WHY WE USUALLY GITS A SAFE, ACCURATE TEST, TH' FIRST TIME!!
Al Capp

C541

Copr. Capp Enterprises, Inc. 1954

JOHNSTON TESTERS

first in drill stem testing

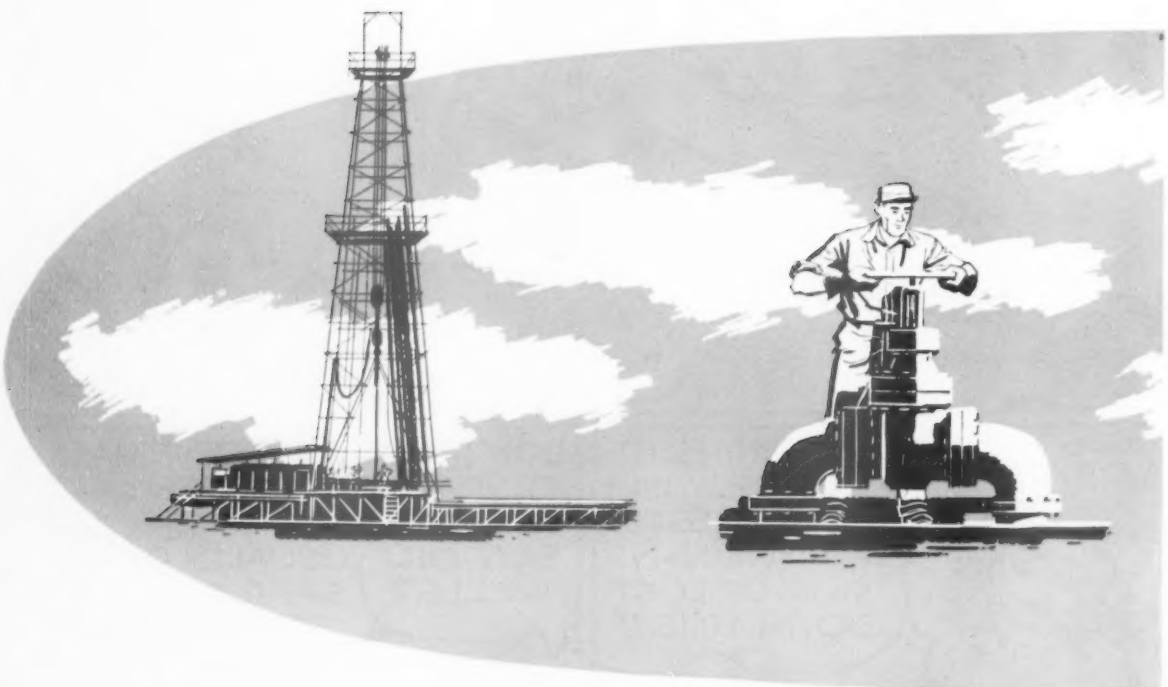
HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

how much can ALCOA

from well to user, Alcoa Aluminum saves money for oil and gas men



ALCOA ALUMINUM INDUSTRIAL BUILDING SHEET has become the favorite lightweight metal for roofing and siding that will stand up in corrosive atmospheres with a minimum of maintenance required.

ALCOA ALUMINUM TREAD PLATE, CONDUIT AND HANDRAILS are also available for use wherever corrosion is a problem.

ALUMINUM PAINT, made of ALCOA Pigments, covers better, lasts longer, costs no more than ordinary paints. That, plus excellent reflective qualities, has made it the most practical, most popular paint in the petroleum industry.

ALCOA ALUMINUM PIPE is particularly economical for construction across rivers, swamps and hilly terrains because aluminum is so light, so easy to handle. Two men can easily handle 40-ft lengths of 8⅝-in. OD pipe.

ALCOA ALUMINUM SHEET is used to weatherproof thermal insulation.

ALCOA ALUMINUM INSTRUMENT TUBING—hundreds of miles of it—are in use throughout the petroleum industry. ALCOA Utilitube® comes in lengths up to 1,000 feet and more . . . costs 40 per cent less than tube made of other corrosion-resistant metals.

FREE—new booklet, *Alcoa Aluminum Heat Exchanger Tubes.* Write for your copy today.

ALUMINUM save you?

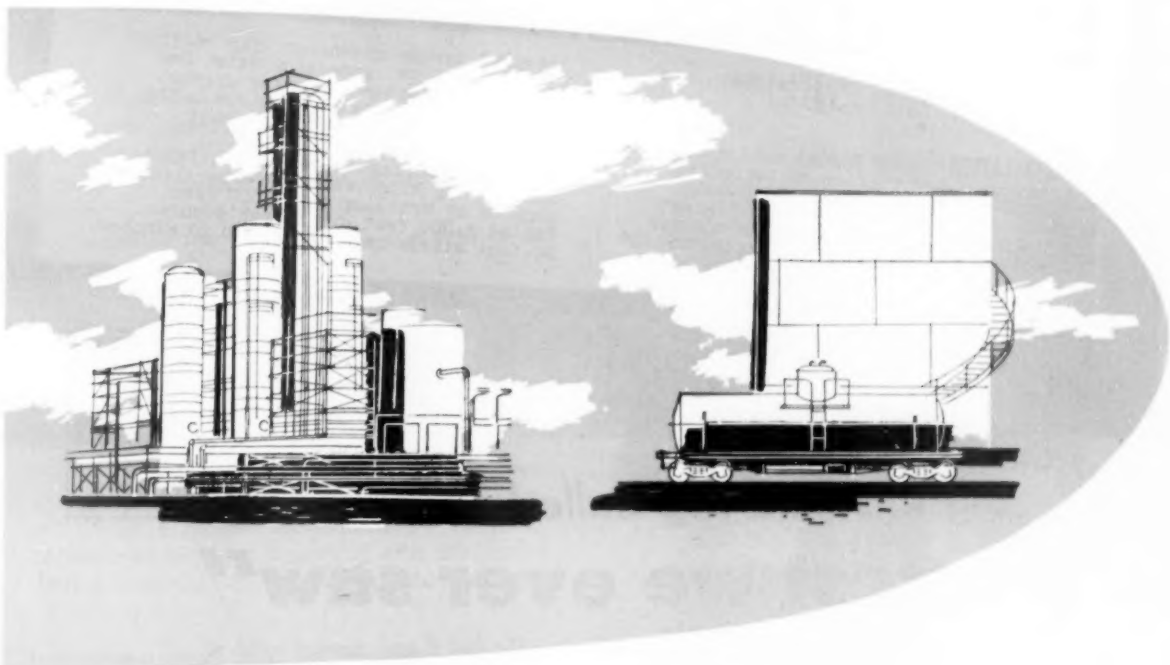
Alcoa Aluminum offers real money savings to the petroleum industry.

It's lower in original cost than other corrosion-resistant metals.

It has excellent low-temperature properties.

It resists corrosion. It's easily worked.

Write today for all the facts.



ALCOA ALUMINUM HEAT EXCHANGER TUBES have been used for more than 20 years, handling sour gasoline stocks. Because ALCOA Aluminum is resistant to hydrogen sulfide, ammonia, carbon dioxide, hydrocarbons and cooling waters, it is ideal for catalytic cracking overhead condensers, compressor intercoolers and aftercoolers.

ALUMINUM BUBBLE CAPS have given service of 10 to 15 years in debutanizer columns, handling gasoline distillate from sour crudes at 200° to 425° F as well as in fractionating columns for sour crude gas oils at 400° to 625° F.

ALUMINUM FORMS FOR MOLTEN SULFUR are used since ALCOA Aluminum has exceptional resistance to sulfur fumes and gaseous compounds.

ALUMINUM TANK CARS, used for more than 25 years to transport sensitive products, cost up to ⅓ less than stainless steel cars.

ALUMINUM STORAGE TANK ROOFS for sour crude oils have been in service for more than 22 years in locations where steel roofs failed in less than five years. Internal supporting structure, hatches, vent lines and other fittings are of ALCOA Aluminum.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

904-D Alcoa Building, Pittsburgh 19, Pa.

GM DIESEL
CASE HISTORY NO. 5312-237

USER: Richfield Oil Corporation, Bakersfield, California.

INSTALLATION: 18 GM Diesel engines deliver total of 2,800 continuous horsepower. Four 6-71 "Twins" drive two D-500 Emsco mud pumps. Three 6-110 "Twins" with integral torque converters drive Oil Well #96 draw works. Single "6-110" drives Emsco D-300 mud pump through integral torque converter. Two "6-71's" drive two 60-kw. generator sets. One "6-71" with torque converter drives Hopper Machine Works coring reel. Rig has 143-foot Ideco full-view mast.

PERFORMANCE: Biggest, most powerful rig operated by Richfield Oil Corporation—capable of drilling to 15,000 feet. Pulled 9,000 feet of 4½-inch pipe in 90-foot stands in one hour and 20 minutes.

It pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL
POWER

Big Richfield Rig Called

"Fastest we ever saw"

After completion of its first hole at 9,700 feet, the big new Richfield Oil Corporation rig in the Bakersfield (Calif.) area has gained the reputation of being the fastest ever seen by its operators. 100 "thribbles" of 4½" pipe in 90 minutes is one record it has set. A more important fact is that all concerned are mighty pleased with its overall performance and smooth operation.

For the smaller rigs as well as for such giants as Richfield's biggest, General Motors Diesel engines offer certain features that make them the preferred drilling and pumping power: *flexibility* of time-tested multiple-engine units, *compactness* for easier and faster moves, *responsiveness* of 2-cycle operation that accelerates faster and is difficult to "pull down," and *lower cost* of the original engines and of service parts. These factors, plus quick availability of parts and service, further explain their popularity. Ask your local GM Diesel Distributor or supply company for full details.

DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H. P.

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

CALIFORNIA—Bakersfield
LAWLESS BROTHERS, INC.
Berkeley
WEST COAST ENGINE & EQUIPMENT CO.
El Cajon
DEAKINS-LANE DIESEL CO.
Los Angeles
ANDERSON-O'BRIEN CO.
Ventura
GEM EQUIPMENT CO.

COLORADO—Denver
THE COLORADO BUILDERS' SUPPLY CO.

ILLINOIS—Mt. Carmel
WESTERN SERVICES

KANSAS—Great Bend
DIESEL EQUIPMENT CO., INC.
Wichita
DIESEL EQUIPMENT CO., INC.

LOUISIANA—Alexandria
UNITED TOOL CO.
Harvey
GEORGE ENGINE CO., INC.
Shreveport
UNITED TOOL CO.

MICHIGAN—Detroit
EARLE EQUIPMENT CO.
Grand Rapids
EARLE EQUIPMENT CO.

MISSISSIPPI—Jackson
TAYLOR MACHINERY CORP.

MISSOURI—St. Louis
WESTERN MACHINERY & ENGINE CO.

NEW MEXICO—Albuquerque
HARRY CORNELIUS CO.

NORTH DAKOTA—Williston
SWEENEY BROTHERS

OKLAHOMA—Oklahoma City
DIESEL POWER CO.
Tulsa
DIESEL POWER CO.

TEXAS—Corpus Christi—Dallas—Houston—Lubbock—Odessa—San Juan
STEWART & STEVENSON SERVICES, INC.
Plainview
DIESEL POWER, INC.

UTAH—Salt Lake City
CATE EQUIPMENT CO., INC.

Built for SEVERE DUTY

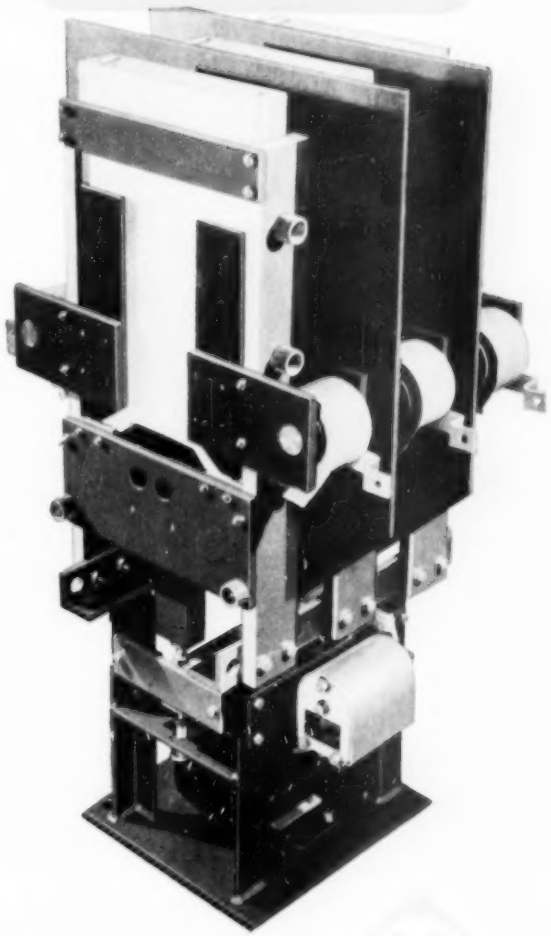
frequent starting • inching • reversing • dynamic braking

ALLIS-CHALMERS

Type 256

AIR CONTACTOR

FOR 2300 TO 5000-VOLT MOTOR CONTROL



Durability and long-term dependability were given prime consideration in the design of the Allis-Chalmers Type 256 air-break contactor. As a result, the roughest repetitive duty becomes routine — contact operations are actually numbered in the millions with a minimum of servicing.

DESIGN FEATURES

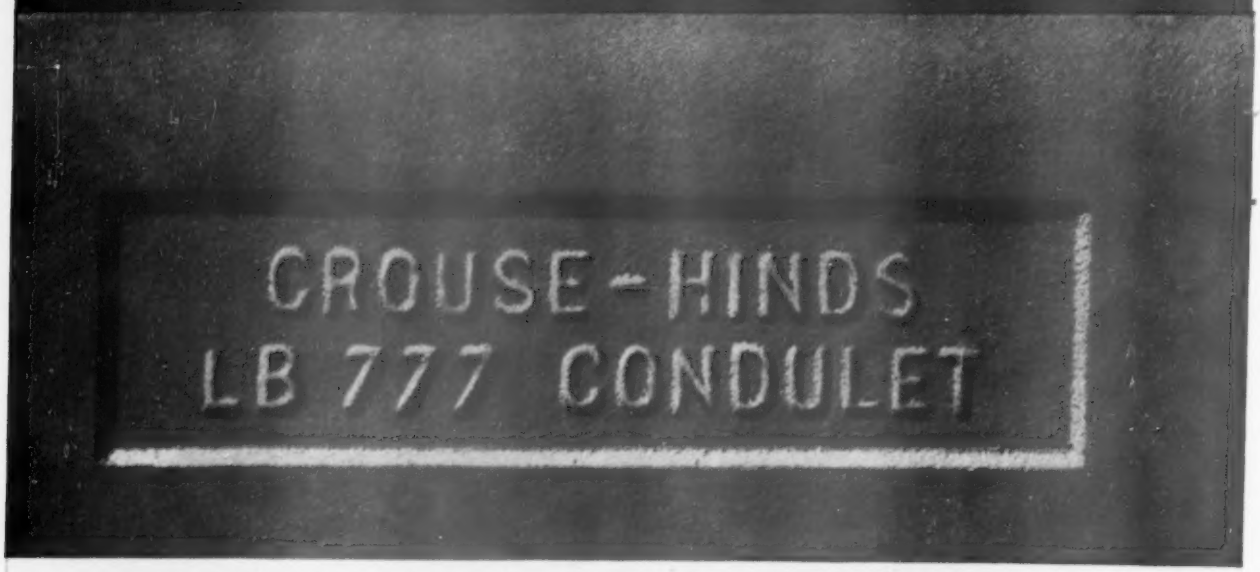
By utilizing a simple vertical motion and double break contacts, troublesome maintenance factors, such as mechanical linkages, turning shafts, shaft bearings and flexible leads, have been eliminated. From the operation standpoint, two gaps in series cut arc voltage in half. Rapid arc extinction is further facilitated by magnetic blowouts at each gap, operating with arc chutes designed to take full advantage of dual blowouts.

In Allis-Chalmers Type H high voltage starters, Type 256 air-break contactors — along with meters, overload relays, current limiting fuses, auxiliary switches — are coordinated to meet heavy duty demands — to provide high capacity interruption and complete protection for man, motor and machine. For complete information see your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletins 14B6410B and 14B7303.

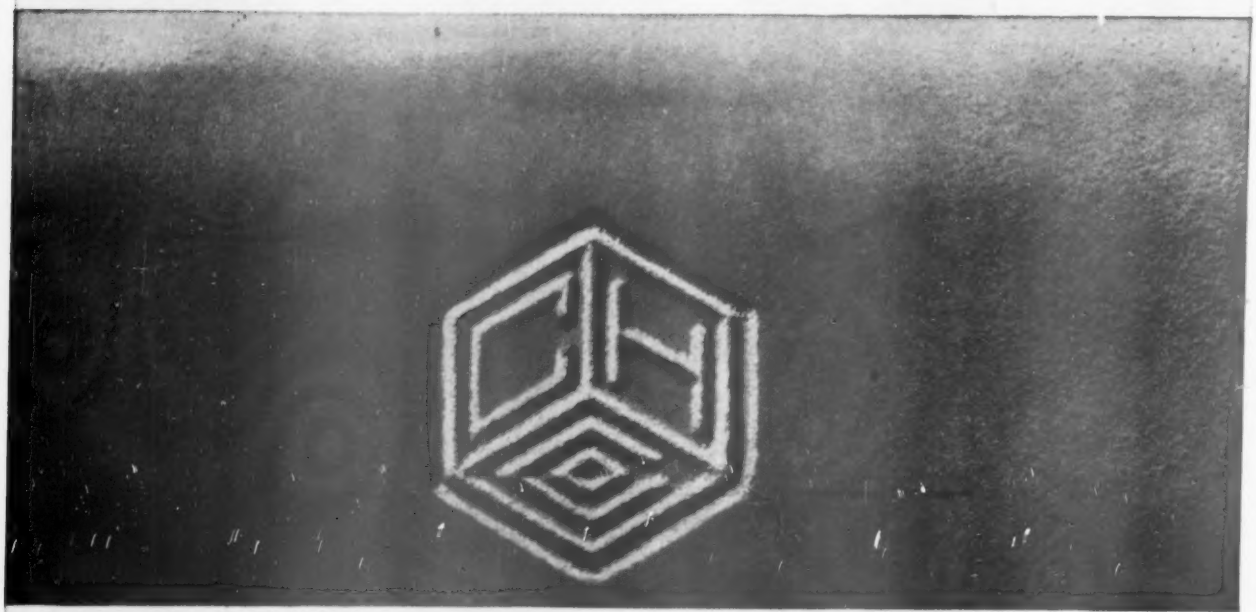
A-4325

ALLIS-CHALMERS

When you ask for



Enlarged view showing how Crouse-Hinds trademark CONDULET is cast right into the body of Condulets for your protection. No other manufacturer can use this trademark.



Enlarged view that shows how the Crouse-Hinds Company cube trademark is cast into the body of Condulets or other Crouse-Hinds products. This is an assurance that you are getting Crouse-Hinds quality.

CONDULETS · TRAFFIC SIGNALS

CONDULETS... be sure that you get CONDULETS*

There is no substitute for CONDULET quality

CONDULETS have always been of the highest quality. To maintain its position of leadership Crouse-Hinds has a large Engineering Dept. constantly developing new products to add to the CONDULET line and improving old ones. Crouse-Hinds foundry and factory have the latest mechanical improvements and modern machinery. This enables the highly skilled craftsmen to turn out a product that is tops in quality. Constant checking and testing proves that this is true.

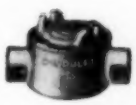
When CONDULETS were introduced by Crouse-Hinds in 1905 they completely revolutionized electrical conduit installation practice. This newly invented line of conduit outlet bodies was so superior to anything else on the market that all electricians were soon using them. They were of such high quality that many of those early installations are still in use . . . in tip-top condition.

When imitations appeared on the market, it isn't a bit surprising that many people called all conduit fittings Condulets. Of course, we appreciate this compliment, but it often leads to confusion. It can be very disappointing if you think you are getting CONDULETS and later discover that the installation was made with a product of some other manufacture.

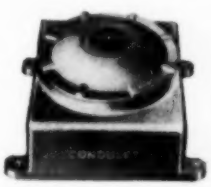
CONDULET is not a common noun. It is a coined word registered in the U. S. Patent Office and designates a product made only by Crouse-Hinds Company.

You can be sure of getting CONDULETS by buying from one of Crouse-Hinds authorized electrical distributors. They are ready to serve you throughout the country. Ask for CONDULETS. Then look for the word CONDULET or the C-H Co. cube trademark on the body. These trademarks appear on every genuine CONDULET.

Type LB
Obround Condulet



Type GUAC Explosion-Proof
Junction Condulet



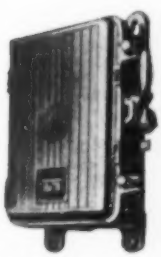
Type GUB Explosion-Proof
Junction Condulet

Type FSC Tumbler
Switch Condulet

Type EFS Explosion-Proof
Pilot Light Condulet

Type EVA Explosion-Proof
Lighting Fixture

Type AREA
Plug Receptacle



Type WMK Watertight
Safety Switch Condulet

When you ask for Condulets
be sure that you get CONDULETS

*CONDULETS are made only by CROUSE-HINDS

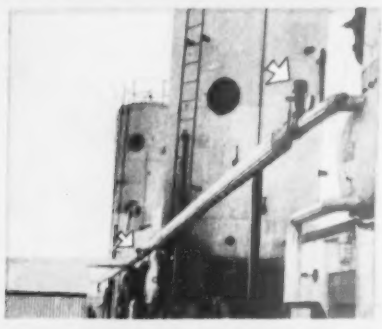
CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston
Indianapolis — Kansas City — Los Angeles — Milwaukee — New Orleans — New York — Philadelphia — Pittsburgh
Portland, Ore. — San Francisco — Seattle — St. Louis — St. Paul — Tulsa — Washington
RESIDENT REPRESENTATIVES Albany — Atlanta — Baltimore — Charlotte — Corpus Christi — Reading, Pa. — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

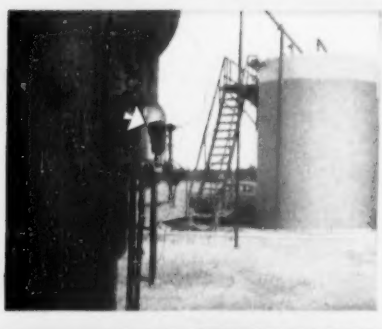
CONDULET
First in the field
STANDARD OF QUALITY

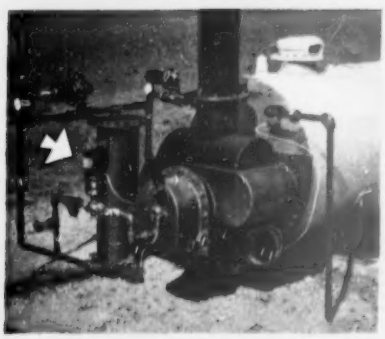
A Nationwide Distribution Through Electrical Distributors

FLOODLIGHTS · AIRPORT LIGHTING



USED BY LEADERS IN THE INDUSTRY





Want Safe, Reliable Control for Your Field Processing Equipment?

Install POWERS

No. 11-OFT Self-Operating Temperature Regulator

✓ Check these features that give Economical Trouble-free Performance — in all kinds of weather

1) Thermal system has OVER-heat protection. Powerful two-ply bellows and single seat composition disc valve assures tight shut off.

2) Valve stem lubricator helps give closer control, reduces packing gland troubles.

3) Rugged, built for long reliable service in all kinds of weather. Operate efficiently down to 60° F. below zero.

4) Durable Valves are direct acting, have single seat bronze body with double unions, for easy installation, composition disc and stainless steel seat.

5) Temperature adjustment range: 110 to 190° F., other ranges between 30 to 370° F.

6) Bulb Well is cadmium plated steel and extra heavy plain capillary tubing is 10 ft. long.

Powers No. 11 Regulators are backed by over 60 years experience making *SELF-OPERATING* controls. They are used by leading manufacturers of heaters and treaters.

Simplify Your Control Problems—Standardize on Powers

[b47]

POWERS CONTROL

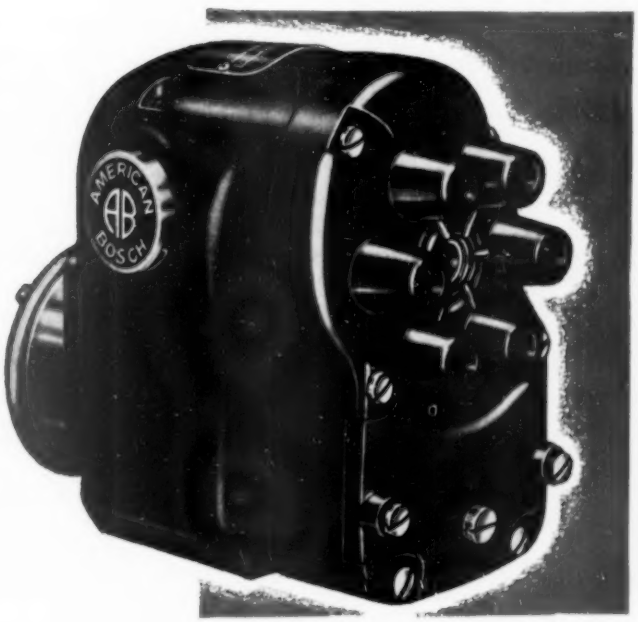
THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS • Offices in Over 50 Cities in U. S. A., CANADA and MEXICO

See Your Telephone Directory

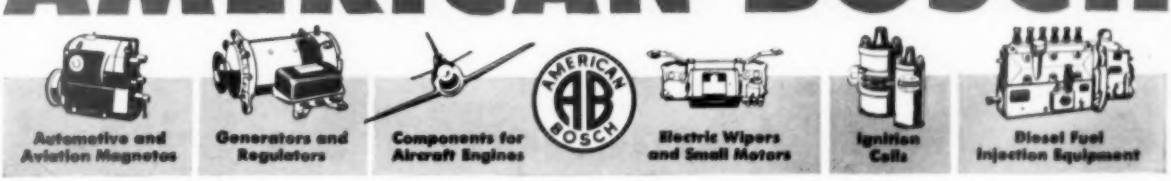
OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

There's an American Bosch Magneto precisely engineered for ALL your replacement needs . . . for the largest, spark ignited, heavy duty engines with high or low tension ignition, right down to the Magnetos required for modern, high speed power units. In countless engine applications, these power-packed Magnetos have proved they are *better to start with and best in the long run* for drilling, producing, pipeline and refinery equipment. From starting time measured in split second response to trouble-free ignition measured in years of service, these rugged Magnetos provide the constant, faultless spark that spells maximum efficiency at all operating speeds and loads. These are the obvious reasons American Bosch Magnetos have been in wide use for so many years as original equipment for many leading engine builders.



Write today for Magneto application data on your low or high tension ignition engines. We'll give you the name of a nearby AB Service Agency, a part of one of the most wide-spread and efficient Magneto service facilities in the world. American Bosch Corporation, Springfield 7, Mass.

AMERICAN BOSCH



THE NEW Cycoil OIL BATH

CYCOIL TYPE "P"

The only high efficiency oil bath air cleaner that meets the lower allowable intake resistance demanded with use of turbo-chargers and pressure blowers for scavenging.

Progress always creates new problems. With modern engines making wider use of turbo-chargers and pressure blowers for scavenging, the need for an entirely new and different oil bath air cleaner was apparent. Lower allowable intake resistance was a "must" accompanied by high cleaning efficiency and large dust holding capacity. Here was a new job for Cycoil—and AAF engineers accepted the challenge. The new Cycoil, Types "P" and "PV", is their answer.

A New Method of Oil Entrainment

The original Type "W" Cycoil impinged the air upon the oil at high velocity. The new Cycoil Type "P" accomplishes this entrainment by means of a perforated plate in the air stream over which oil flows from the central distributing head.

Here's how it works. The metered orifices in the plate are calibrated to increase the velocity of air flow through the openings to entrain the oil that tends to spill over the edges and at the same time distribute the air flow uniformly over the filter area.

The air leaving the perforated plate with its oil and dust content passes upward into a conical shaped filter designed to accelerate the flow of the collected oil droplets to the perimeter of the filter out of the air

American Air Filter
COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

MODERN ENGINE DESIGN DEMANDS IT!

AAF RESEARCH SUPPLIES IT!

LOW RESISTANCE TYPE AIR CLEANER

stream. This washing action keeps the filter clean and the dirty oil flows back to the reservoir where dust and grit settle out as sludge. A secondary filter is provided to remove any oil mist that might escape the conical filter.

The oil reservoir, at bottom, is hinged to swing clear of the Cycoil casing for easy sludge removal and oil replacement. A small motor driven oil circulator supplies a constant flow of oil over the orifice plate.

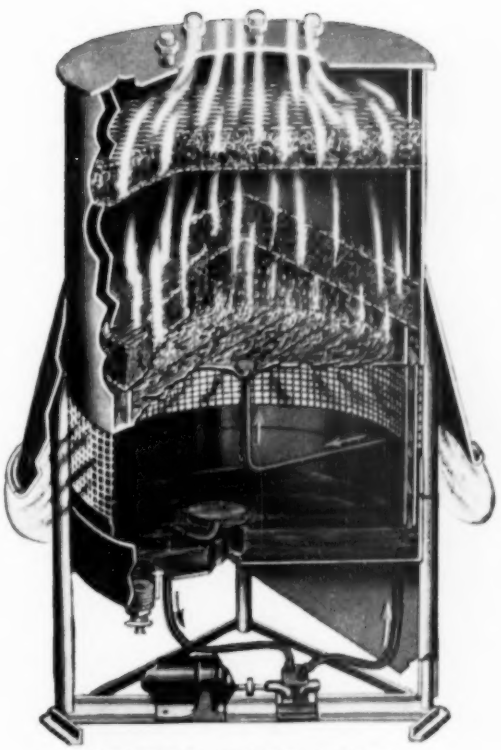
Two Types Permit High Efficiency Dust Removal From 10% of Rating To Full Capacity

The Cycoil Type "P" with standard metered orifices maintains a high efficiency in dust removal from *50% of rated capacity to maximum rating.*

The Cycoil Type "PV" is identical to the Type "P" except that hinged Vari-flow valves are added to maintain a constant ratio of orifice openings to air velocity. This single addition permits positive oil entrainment and sustained high cleaning efficiency *from as low as 10% of rating to full capacity.*

For the Hot Climates— Cycoil With Evaporative Cooler!

The Cycoil Type "P" is also available with an evaporative cooler using the perforated-plate principle to evaporate the water. This self-contained, combination unit features two perforated plates and filters in series, one flooded with water to cool the air and the other flooded with oil to remove the dust. Still another arrangement is applicable to engines using aftercoolers.



CYCOIL TYPE "PV" with Vari-flow valves

AAF

MAIL THIS COUPON, NOW!

American Air Filter Co.
444 Central Ave., Louisville 8, Ky.

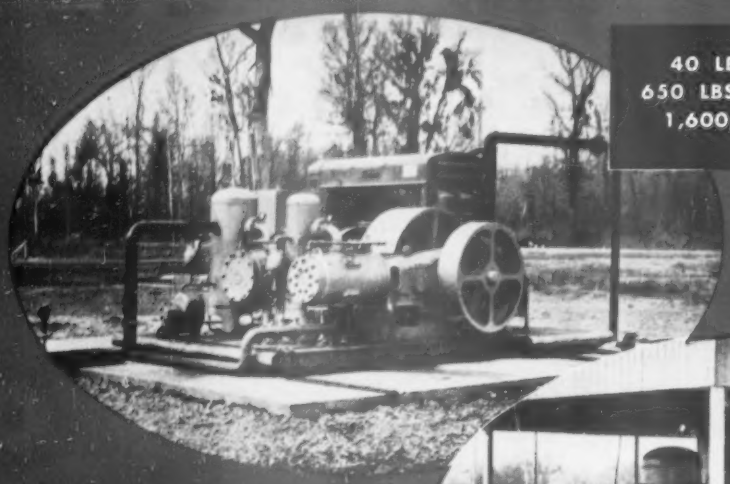
Send me free copy of Bulletin No. 160 describing the new Cycoil Low Resistance Oil Bath Air Cleaner.

Name_____

Company_____

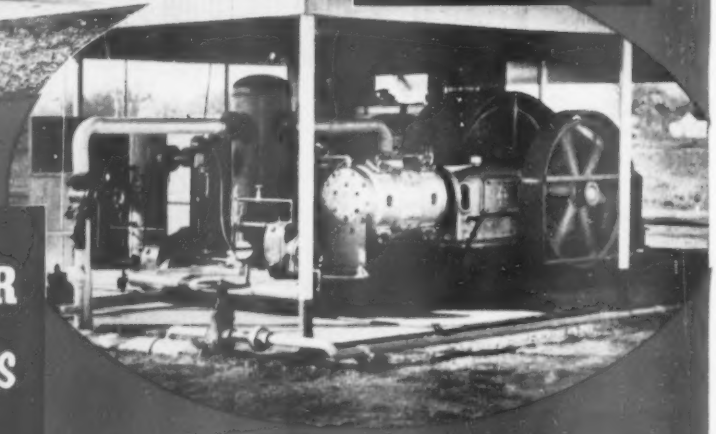
Street_____

City_____ State_____



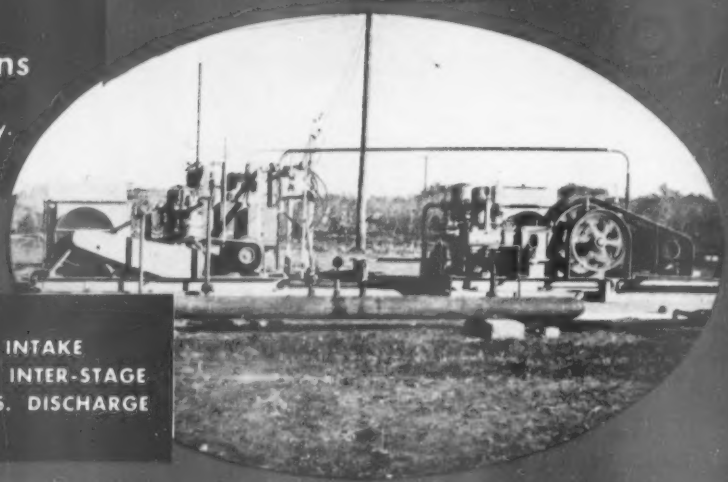
40 LBS. INTAKE
650 LBS. DISCHARGE
1,600,000 C.F.D.

20 LBS. INTAKE
990 LBS. DISCHARGE
325,000 C.F.D.



GARDNER-DENVER
Booster Compressors
are tailored to
your field conditions

Send for Bulletin BC-1 today.



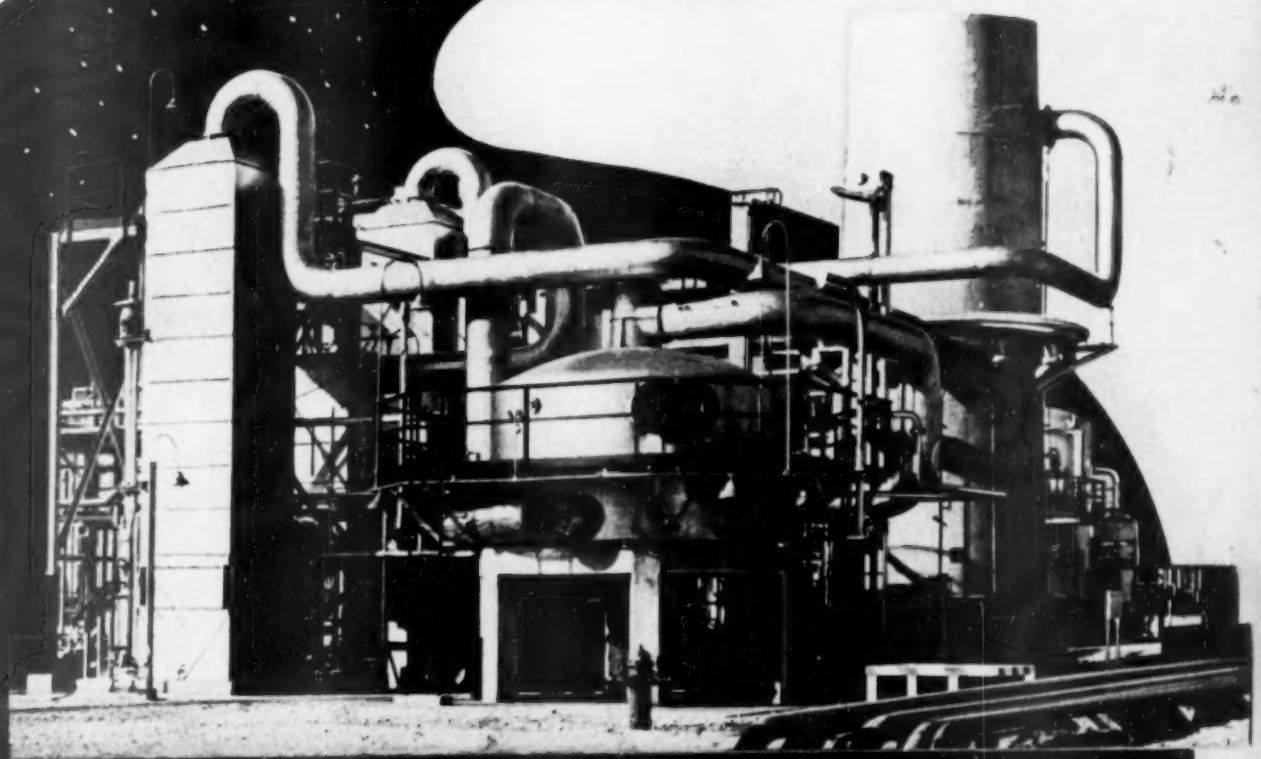
20 LBS. INTAKE
400-500 LBS. INTER-STAGE
1000-1500 LBS. DISCHARGE

SINCE 1859

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY
Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd. 14 Curity Avenue, Toronto 13, Ontario

sulfur recovery at FAWLEY

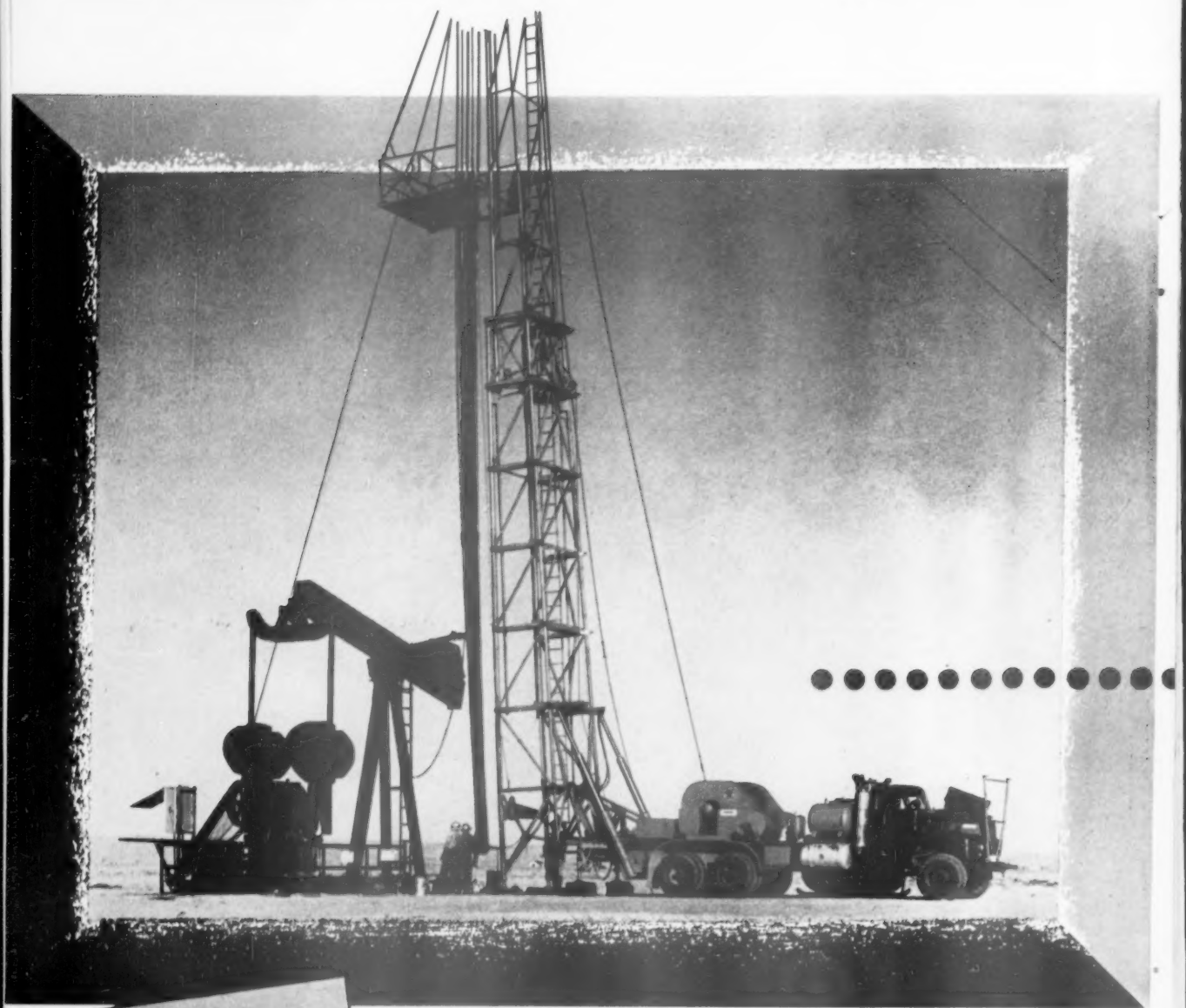


One of 18 individual process units, designed and constructed by Foster Wheeler, for this 125,000 bbl/day refinery of Esso Petroleum Company Ltd., this Sulfur Recovery unit is producing 40 Tons/day of commercially pure Sulfur for British Industry.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

Can you afford to ignore



OILFIELD SALES-SERVICE NETWORK

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co. — Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, New Orleans, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation — Shreveport, Louisiana, El Dorado, Arkansas and Clarksdale, Jackson, Mississippi.

West Coast
Le Roi Engine Sales Co. — Long Beach, California

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

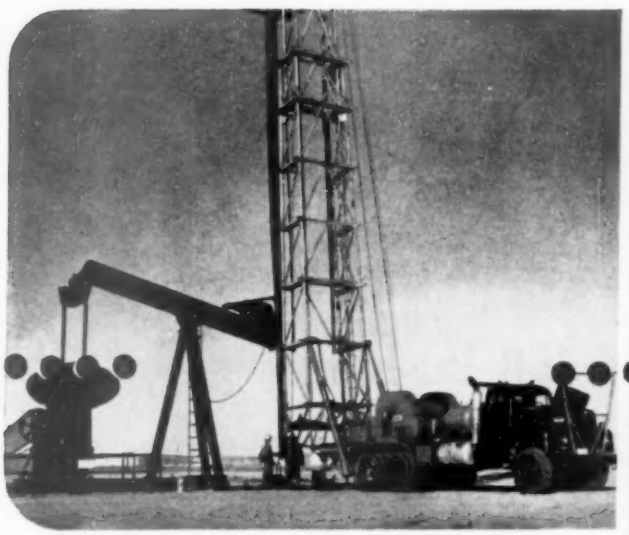
Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

these well-servicing savings?

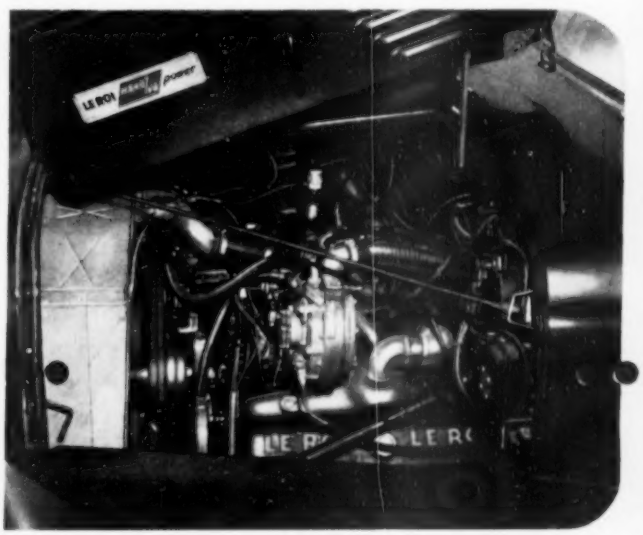
Major producer replaces original truck engine with LE ROI H540/V8

Saves as much as 7½ hours pulling 2½" tubing from 8,300' well!

Saves as much as $1650.00 over contract price of servicing well!



This Frank's well-servicing unit is powered by a Le Roi H540. Unit includes a 90' 150,000-lb. derrick. One major petroleum company operates H540-powered rigs like this in the Rocky Mountain area, Oklahoma City, and West Texas.



Le Roi's H540 is the first 200-hp, high-compression, valve-in-head V-8 engine for heavy-duty truck applications. It is only 45" long. Its power ratio is only 6 lbs. per HP — the lowest of all comparable engines. It burns gasoline or LPG.

IF you are interested in cutting your costs to the bone (and who isn't?), the Le Roi H540 should be of great interest to you. The big savings of time and money shown here tell you that.

The figures above were established by one of the well-servicing units of a major petroleum company in the Rocky Mountain area. The original power unit in this rig was replaced by a Le Roi H540 200-hp V-8 engine. After the H540 was installed, 2½" tubing was pulled from a 8,300' well in 4½ hours. Previously, the elapsed time had been 10 to 12 hours. So, H540 power saved the company as much as 7½ hours' time.

This saving was reflected in the cost of servicing the well. Where the contract price formerly had been $1500.00 to $2000.00, it was reduced to an actual cost of only $350.00 with H540 power.

Now, that wasn't just an isolated case. The same company had a similar experience in a West Texas field. There, H540 power pulled 2½" tubing from a 9,700' well in 4 hours flat. Previously, the elapsed time had been a day and one-half or 12 hours' time. A saving of 8 hours was realized with H540 power.

Ask equipment manufacturers to give you the advantages of Le Roi H540 power on equipment *you* buy.

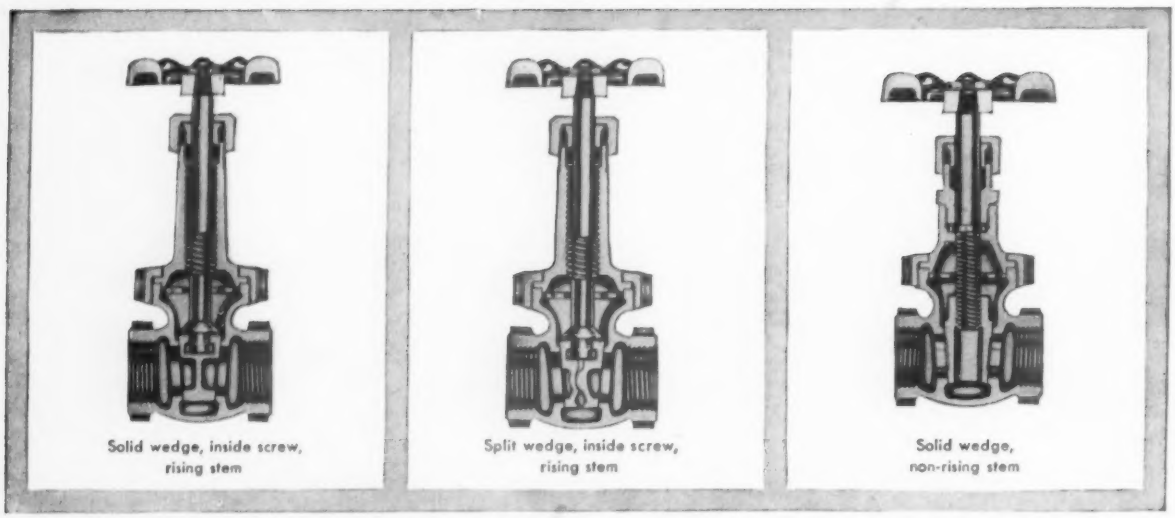
LE ROI

LE ROI COMPANY

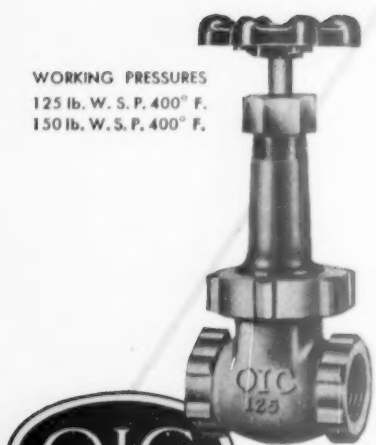
A Subsidiary of Westinghouse Air Brake Co.
MILWAUKEE 14, WISCONSIN
Plants: Milwaukee • Cleveland • Greenwich • Dunkirk, Ohio • Coldwater, Mich.
Oilfield Headquarters: Tulsa, Oklahoma

P-128

Oh, I see



. . . we've added 125 and 150 lb. bronze gate valves to our union bonnet line



WORKING PRESSURES
125 lb. W. S. P. 400° F.
150 lb. W. S. P. 400° F.

Success of our 200 lb. line of union bonnet bronze gate valves necessitates expansion of the line to include 125 lb. and 150 lb. classes. Sizes range from ¼ to 2 inches.

NOTE THESE ENGINEERING FEATURES:

This line has a flat seat on the bonnet which mates against the body, providing adequate bearing area for sealing.

Tight bonnet joint, but easy access to interior for inspection and service.

Full ports permit unobstructed flow.

Back-seating arrangement permits repacking while under pressure.

Split wedge has ball in socket contact . . . permits wedge to adjust itself to seat.

Slip-on type "T" head stem-to-wedge connection.

Lug-type hexes make valves compact and provide a better wrench-gripping surface.

To learn more about this expanding line of valves, write for our *Union Bonnet Bronze Gate Valve Catalog Folder.*

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

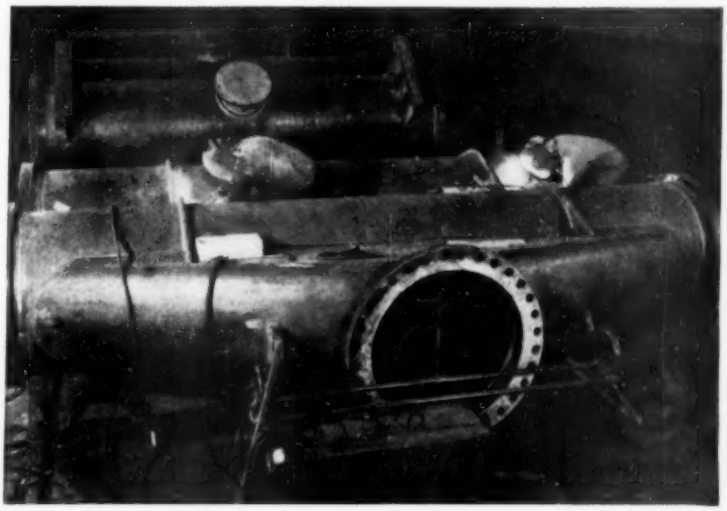
PROCESS EQUIPMENT NEWS

PUBLISHED BY FABRICATED PRODUCTS DIVISION, THE M. W. KELLOGG COMPANY APRIL-MAY 1954

3,360 Red Brass Tubes for This Condenser

Shown on one of Kellogg's boring mills (below) where the gasket face is being machined, this is a channel for one of four sections of a prefractionator condenser currently underway for a southwestern petroleum refinery.

Each bundle of the condenser will contain 840 tubes, $\frac{3}{4}$ inch in outside diameter by 16 feet in length. The water available for industrial purposes in the particular area where the condenser will be used is especially corrosive. To offset this, specifications call for red brass as the material for the tubes, this alloy having proved by experience to give the most effective protection against corrosion in the locality involved.



Tube sheets for the condenser will be of steel, clad with naval brass. Shell, shell cover, and channel are of steel. Design temperature is 200°F. on the shell side and 150°F. on the tube side.

Big Condenser Will Hold Pressure Drop to 5mm. Maximum

The drip-type condenser shown above in progress in Kellogg's shop has been designed to hold pressure drop on the shell side to the exceptionally low maximum of 5 mm. of mercury. Consisting of two sections, the unit will condense naphtha vapors and steam on the shell side and heat a petroleum distillate on the tube side. Operating pressure on the shell side will be 65 mm., and 150 psi. on the tube side.

Representative of one of the more complex types of exchanger units Kellogg is experienced in building, in addition to all the conventional types, this condenser is designed with an obround nozzle to spread the incoming vapors over the entire length of the tube bundle, thus providing for pure cross-flow heat transfer.

44,000-lb. Reactor for New Chemical Process

Similar in design to units refiners use in transforming certain petroleum gases into polymer gasoline, this big reactor (right) will shortly become an important part of a new chemical plant now building on the East Coast. The plant will be the first in this country to manufacture phenol from cumene, an intermediate material which in turn is obtained from benzene and propylene. This particular unit is the vessel in which the reaction to produce cumene will be carried out.

The tubular reactor is $3\frac{1}{2}$ feet in internal diameter by $35\frac{1}{2}$ feet in length, and is fabricated of high-tensile carbon steel, $1\frac{5}{8}$ inches thick. When completed, it will tip the scales at some 44,000 pounds. The unit is designed for an internal pressure of 990 psi, and temperature of 540°F.

For further information, details of methods, etc. contact
FABRICATED PRODUCTS DIVISION
THE
M. W. KELLOGG
COMPANY
225 Broadway, New York 7, N. Y.
or offices in Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London & Paris
KELLOGG PULLMAN

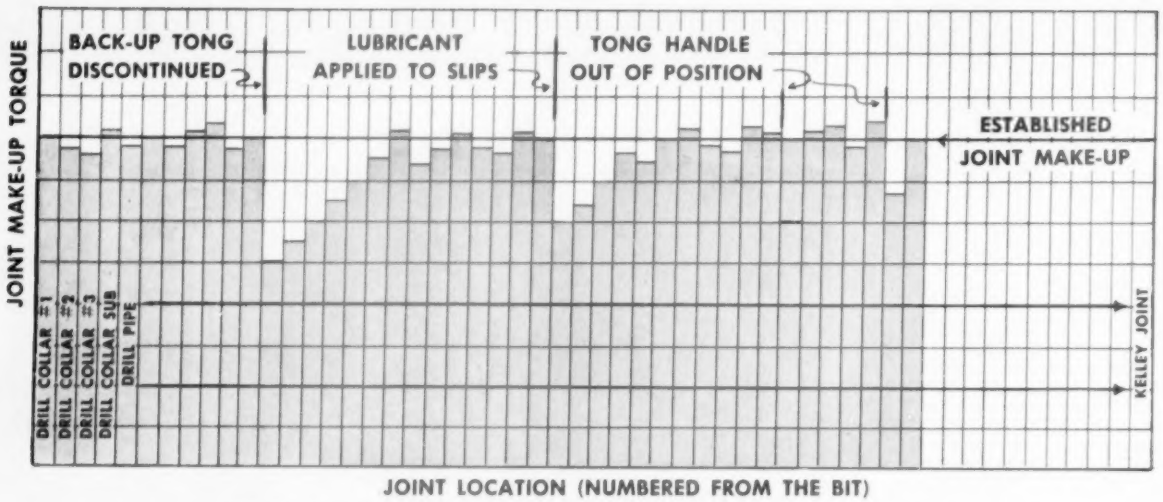


FIG. 1. diagram showing typical variation in joint tightening which can occur when making up a drilling string by conventional methods.

New Tool Reveals Unsuspected Causes of Loose Tool Joints, Drill Collars and Drill Pipes

Fig. 1 Above illustrates graphically three conditions which can result in undertightened joints unsuspected by the driller. These joints then become likely points for a washout to originate. The tool which visually shows these conditions on the rig is the Martin-Decker Tong Torque Gauge, which many progressive operators are now using as insurance against these troubles.

The sharp drop-off in joint torque at the point where use of back up tongs is discontinued is apparent when a Torque Gauge is used and the back up tongs are removed at the point where it appears that the slips are holding. The drop-off is due to a combination of two things. The slips turn slightly in the bowl and do not give as solid a back up as the tongs, thus the momentum effect of the cathead clutch is lost by this cushioning. Also, in turning in the bowl, the slips allow the tong handle to turn past the operating position—which is normal to the jerk line. This has the effect of shortening the effective lever arm of the tong handle. Utilization of the torque gauge will show the driller at what joint the back up tong may be safely discontinued. In many cases this will prove to be farther down the hole than the joint where it appears that the slips are holding against rotation.

The second condition illustrated by the graph shows the effect of lubricating the slips. The result is a decrease in joint torque if lubricant is applied shortly after removal of the back up tongs. If lubricant is applied while the back up tongs are in use, the result is a longer interval before the tongs may be safely removed. The actual effect can vary considerably depending on the type and amount of lubricant used.

The last condition shown on the graph could occur at any point, but illustrates the effect of the tong handle being rotated out of position normal to the jerk line. The effect will not be shown by the torque gauge unless it is applied to the back up tong line. When used on the back up line, the length should be adjusted to give a right angle with the tong handle. (Advertisement)

Martin-Decker tong torque gauge

Gauge installed on tongs

YOU MAY HAVE A JOB LIKE THIS SOME DAY!

● Look at that digging! Only a ruggedly built machine could stand up on a job like this. This is one of the Northwests owned by R. H. Fulton & Co. of Lubbock, Texas and it is working on a pipeline job near Laguna, New Mexico. R. H. Fulton is an old time Northwest user and has owned nineteen or more Northwest machines.

Northwests are built for the tough pipeline jobs. Cast steel bases and cast steel machinery side frames take the shocks of digging. Uniform Pressure Swing Clutches give even pressure over the entire area of the clutch. There is no variation of clutching force as there is between the live end and the dead end of a band clutch. This means smoother engagement, better control in digging like this and more accurate spotting in dumping the bucket.

The "Feather-Touch" Clutch Control makes operation easy without resorting to valves, pumps and compressors that often mean special knowledge for adjustment.

Northwest Crawlers with their easy steering and self-cleaning action have been proved in the miles of travel characteristic of pipeline work. There are other advantages that will interest pipeliners and oil men with lifting and excavating problems.

We'd like to tell you more about the Northwest. Send the coupon for more details and a catalog.

NORTHWEST ENGINEERING COMPANY
1517 Field Building, 135 South La Salle Street, Chicago 3, Illinois

● If you are interested in Rubber Tired Equipment ask about the Northwest Truck Crane. It has many special advantages that improve performance.

Send it!

NORTHWEST

CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

NORTHWEST ENGINEERING COMPANY
135 South La Salle Street, Chicago 3, Illinois

Please send me complete information and catalogs on equipment as checked:

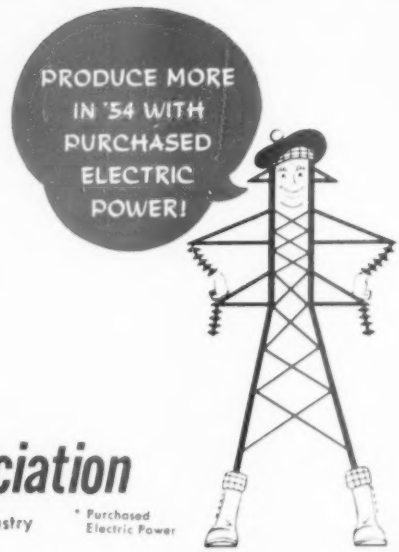
☐ Shovel ☐ Crane ☐ Dragline ☐ Pullshovel
☐ Truck Crane Capacity

Name
Address
Town Zone State
Signed

To secondary recovery operations, Purchased Electric Power brings dependable, 24-hour-a-day power at *lowest possible cost* . . . . just another instance which shows how PEP* is benefiting the Petroleum Industry.

Yes, PEP* works day and night — or operates on any fractional time schedule . . . . which means you pay only for power used. Upkeep and maintenance costs are lower, too . . . . which means that manpower and payroll costs are also cut to the bone.

Let Purchased Electric Power go to work for *you!* There's a Power Engineer at your nearest Electric Power Company who can give you the answers to all your power problems. Why not get in touch with him today?



CALL YOUR NEAREST ELECTRIC SERVICE COMPANY **for more facts, or address your request to P. O. Box 2771, Dallas, Texas**

Petroleum Electric Power association

ORGANIZED in the interest of greater service to the petroleum industry

* Purchased Electric Power

Both engine and generator are mounted on a sturdy frame. Two-wheel mounting also available.

New P&H WN-250 Pipeliner

–an engine-driven arc welder developed by pipeliners to meet pipeline-welding requirements

Here you get everything you've ever wanted in a pipeline welder — including features you don't get from any other. Take a look:

(1) The P&H WN-250 is NEMA-rated at 200 amps—*but pulls 300 amps!*

(2) It has a full 20-gallon gas tank — runs all day on one tankful!

(3) It is powered by a four-cylinder, 180 GLU, Waukesha gasoline engine —direct-connected, water-cooled, and built for heavy duty. And we really mean *heavy* duty — it's not an automotive light-weight.

(4) P&H idling device establishes the rated speed of 1800 rpm as soon as the arc is struck. This speed is maintained for a set period after the arc is broken.

(5) P&H Dial-lectric Control provides stepless heat adjustment over the entire 3 ranges — with just a turn of a radio-type knob.

(6) Pre-lubricated bearings reduce the need for servicing and insure longer life.

(7) Auxiliary AC power-supply (1 KVA) permits flood-lighting and running power-tools.

There are other reasons why you're money ahead with a P&H WN-250. Ask your P&H representative or distributor for all the facts. Or, write for bulletin.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4527 W. National Ave., Milwaukee 46, Wis.

Continuous 8-hour welding test demonstrates the extra stamina of the P&H WN-250

You can't beat welding performance like this: In a recent test, the P&H WN-250 operated continuously for 8 hours on a 70% duty cycle.

A 5/32" electrode was used with 300 feet of cable. There were 250 amps. at the electrode. So that the test would be continuous, three welding operators were used. When one got tired, another took over. All used the drag technique with a 6010 rod — which is as close to a short circuit as you can get.

At the end of 8 hours, the P&H generator was still cool. And the WN-250 was still rarin' to go—the weldors were worn out, but not the machine.

the P&H *Line*

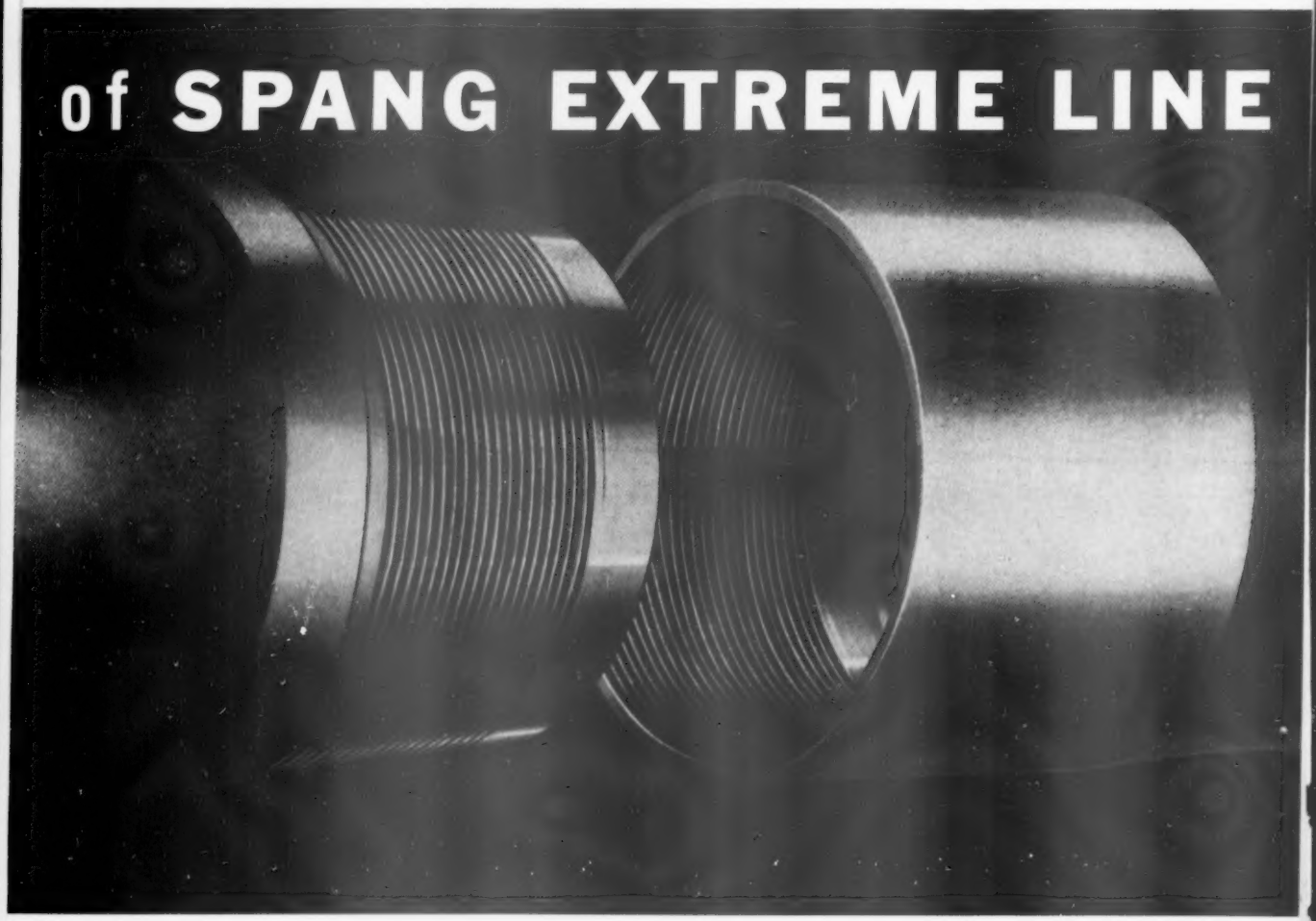
2595A

P&H Welding equipment is manufactured and sold in Canada by
REGENT EQUIPMENT MANUFACTURING COMPANY LTD.
455 King Street West • Toronto, Ontario, Canada

here's why

operators prefer the

of SPANG EXTREME LINE



First in quality ... First in supply service ... in oil country everywhere

Spang-Chalfant Division

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

NATIONAL BLUE PRODUCTS

DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Pittsburgh, Pennsylvania; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

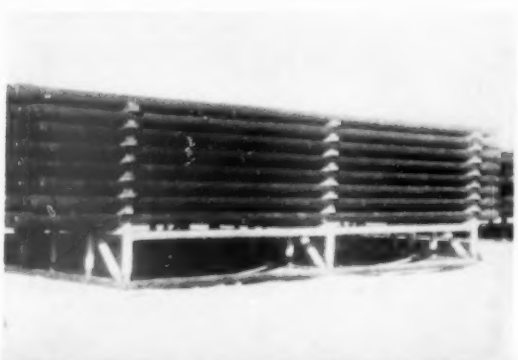
quality

CASING

Grade J-55 55,000 PSI minimum yield strength

Grade N-80 80,000 PSI minimum yield strength

Grade P-110 110,000 PSI minimum yield strength



SPANG EXTREME LINE CASING IS:

PRECISION-MANUFACTURED—Spang Casing has the mechanical and metallurgical properties to withstand the high tensile loading, and to resist the extreme pressures found in present-day deep drilling.

STREAMLINED—Interior and exterior contours provide for maximum running efficiency. There are no shoulders to hang-up on hole projections, or to scrape mud seal from the walls of the hole. The integral joint reduces the number of threaded connections by one-half.

EASY TO HANDLE—Very easy to stab, *cannot* be cross threaded, positive shoulder contact engagement prevents overtonging. Only 5 to 7 turns with spinning line and less than one turn with the tongs are needed when running. Spang Extreme Line Casing can be salvaged and re-run repeatedly.

100% LEAK-RESISTANT—This positive resistance to leakage is of primary importance in the choice of high strength casing for deep, high pressure wells. The rugged integral joints of Spang Extreme Line Casing are your assurance of complete leakage resistance under the most severe and variable conditions you can encounter.

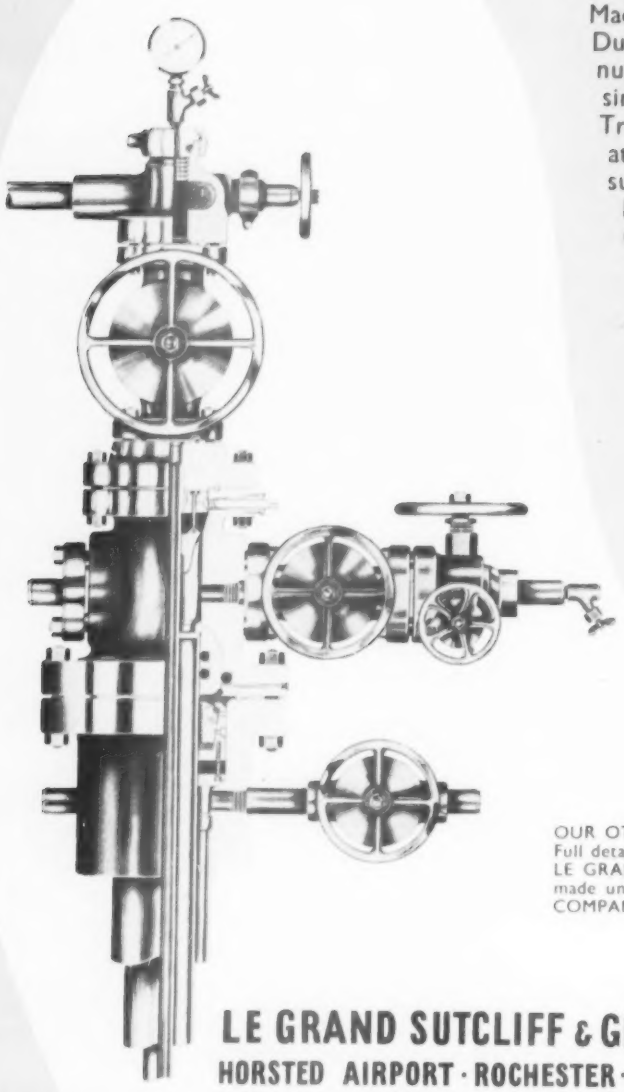
Specify the famous Spang Family of tubular products for quality that pays off in the well. Spang Extreme Line Casing is a member of this family which includes:

Spangweld Drill Pipe
Spang Double Seal Shrink Thread Drill Pipe
Spangseal Tubing
Spang Extreme Line Tubing
API Casing and Tubing

To increase corrosion resistance, a phenolic plastic coating can be applied at the mill on all Spang Tubing and Drill Pipe. Ask the National Supply Representative about this Spang service.

For detailed information on how Spang Extreme Line Casing can pay off in the well for you, call the nearest Division Tubular Office listed at left or write Pittsburgh.

Wherever Flow Control is Vital



LE GRAND O.C.T. Flow Controls represent the latest development in Christmas Tree equipment. Made in two types (Single and Dual) **ONE** unit replaces the numerous parts of a conventional single or double arm Christmas Tree with **INCREASED** efficiency at **HALF** the price. Full details supplied on request.

Like all other LE GRAND O.C.T. Well-head Equipment, LE GRAND O.C.T. FLOW CONTROLS are manufactured in ENGLAND under licence from The OIL CENTER TOOL CO. of Houston Texas. Materials comply with A.P.I. Standard specifications and all components and spares are interchangeable with similar equipment manfactured in the U.S.A.

OUR OTHER PRODUCTS:—
Full details of LE GRAND Pumping Units and LE GRAND O.C.T. Well-head Equipment as made under licence from OIL CENTER TOOL COMPANY will be gladly sent on request.

LE GRAND SUTCLIFF & GELL LIMITED.

HORSTED AIRPORT · ROCHESTER · KENT · ENGLAND

Represented in the following areas by agents who will be pleased to assist you:—

TRINIDAD:—
The Industrial Agencies Ltd.,
14 High Street,
San Fernando.

EASTERN VENEZUELA:—
A-Z Export S.A.,
Apartado 4026,
Puerto La Cruz.

WESTERN VENEZUELA:-
A-Z Export S.A.,
Apartado 304.
Maracaibo.

LE GRAND

MORE POWER for the TOUGH JOBS

More power, and *better* power—that's what you get when you buy a truck with Continental Red Seal under the hood. *Better* because the engine delivers more power in relation to its weight, which means higher payload capacity. Better, too, because the output is delivered at engine speeds conducive to fast over-the-road travel with a minimum of shifting. For the really tough jobs, choose a truck with a power plant that's *built* for the tough jobs and backed by engine experience dating from 1902.

PARTS AND SERVICE COAST TO COAST

*TM REG.

Continental Motors Corporation
MUSKEGON, MICHIGAN

1819 BROADWAY, NEW YORK 23, NEW YORK • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA.
1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

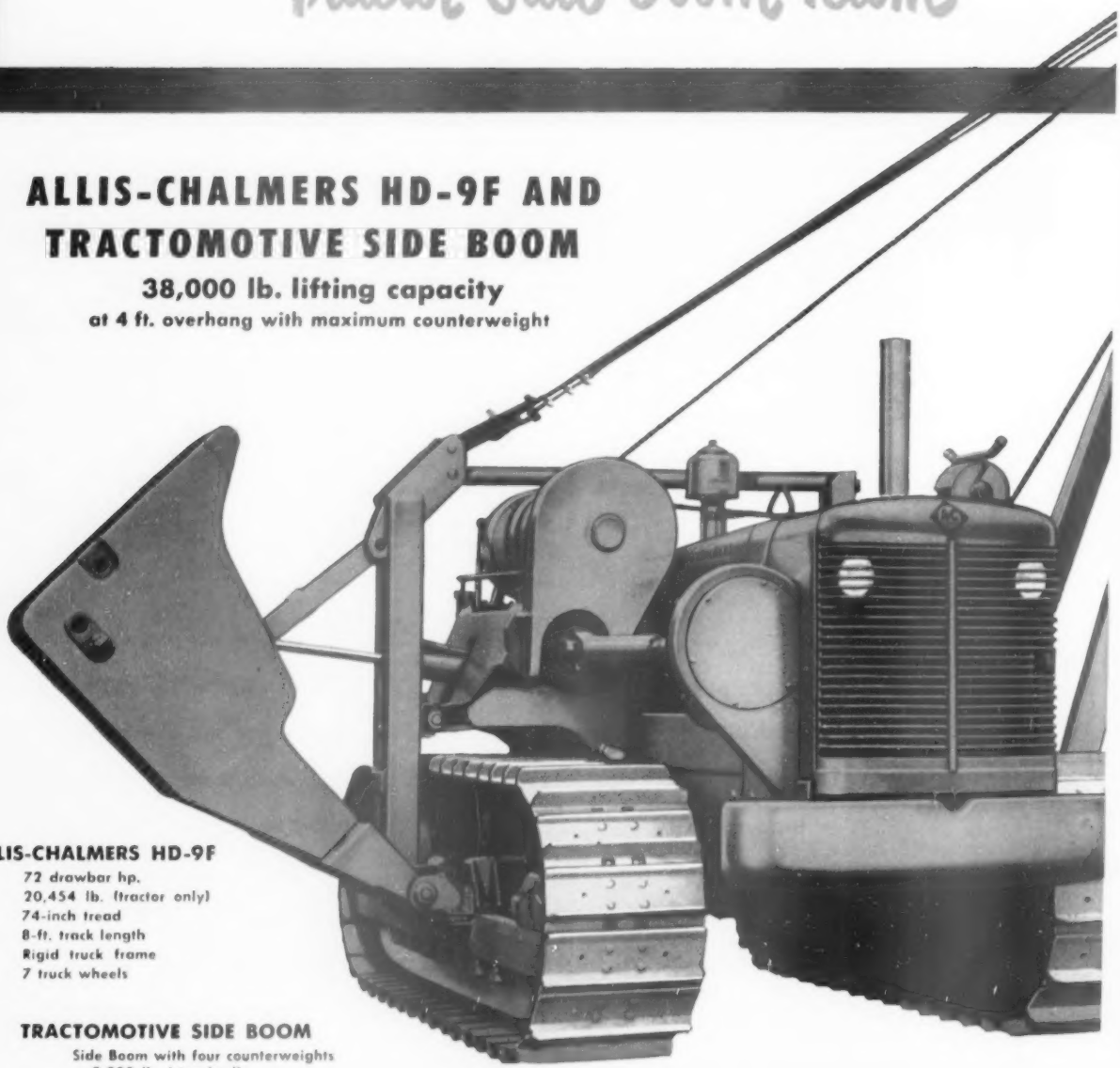
CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

ANNOUNCING

Another New Advance Design Tractor-Side Boom Team

ALLIS-CHALMERS HD-9F AND TRACTOMOTIVE SIDE BOOM

38,000 lb. lifting capacity
at 4 ft. overhang with maximum counterweight



ALLIS-CHALMERS HD-9F

72 drawbar hp.
20,454 lb. (tractor only)
74-inch tread
8-ft. track length
Rigid truck frame
7 truck wheels

TRACTOMOTIVE SIDE BOOM

Side Boom with four counterweights
9,900 lb. (standard)
Side Boom with six counterweights
11,900 lb. (maximum)
Boom Length — 15 ft.
Over-all width — 10 ft.
Shipping width, mounted — 8 ft. 2 in.

SEE YOUR ALLIS-CHALMERS DEALER FOR THE FULL STORY

This new heavy-duty Allis-Chalmers HD-9 Tractor and side boom provides new strength, power and exceptional lifting capacity to handle a wide range of pipeline jobs. With its speed and high maneuverability, this combination can save money on jobs now handled by bigger, more expensive machines. It is the right answer for construction of feeder, distribution and smaller inch cross-country lines — ideal size on the big inch jobs for stringing, handling pipe joints for welding crews and bending machines — economically handles maintenance, repair and take-up work on existing gas, crude oil and product lines.

A Pipeliner's Tractor

The HD-9 answers the pipeliner's demands for performance, simple servicing, dependability, operating ease. Just by shifting a single lever, operator can go from any of the six forward speeds to any of the three reverses. This, plus easy handling boom controls, direct electric starting on diesel fuel, booster steering, self-energizing brakes and adjustable seats, speeds up the job — work is done faster, more safely, and at lower cost.

Extra long track and excellent balance give the HD-9 the stability and flotation for operation in mud and tough going. Seven truck wheels for each track mean smooth, easy rolling. Double reduction final drive and smooth, clean bottom construction provide extra clearance which permits skimming over obstacles that might otherwise "hang up" a tractor.

Like all Allis-Chalmers tractors, the HD-9 is a cinch to service. Truck wheels, support rollers and front idlers require lubrication only once every 1,000 hours. No lube points under tractor. Unit construction — major assemblies are removable without disturbing companion groups.

New Heavy-duty Tractomotive Side Boom

FEATURES TWO NEW MAJOR DEVELOPMENTS

FRONT MOUNTED POWER TAKE-OFF — Power is taken from engine crankshaft — permits side boom to work independently of tractor master clutch. Back of tractor is free for winch or other rear-mounted equipment.

DUAL CLUTCH SIDE BOOM CONTROL — one for raise, the other for lower. By merely pulling one lever, operator can switch from "raise" through "neutral" to "power down" on either load or boom lines—no gear shifting necessary. Operator can act fast in an emergency — an important safety factor. Other features include:

- **CONVENIENT CONTROLS** — easy operating, positive, conveniently located.
- **SURE-GRIPPING BRAKES** — exclusive, internal expanding brakes provide positive control of load and boom line drums. Completely enclosed from dirt and moisture.
- **SAFETY-LINK EXTENDABLE COUNTERWEIGHTS** — controlled hydraulically and mounted high for maximum clearance. Safety linkage prevents accidental dropping.
- **QUICK-ON, QUICK-OFF SECTIONAL FRAMES** — pin-connected for quick installation and removal . . . makes it easy to ship or service tractor.
- **HUSKY, 15-FT. BOX SECTION BOOM** — automatic clutch throw-out prevents bending of boom against boom stop.
- **SIMPLIFIED TRANSMISSION** — 2 forward and 2 reverse speeds for load line and boom line.
- **OPERATOR AND CREW SAFETY FEATURES** — sure-gripping, weatherproof brakes . . . big, husky brake levers, ratchets, and linkage . . . positive locking winch controls . . . massive winch drum jaw clutches . . . drop-proof counterweight linkage.

ALLIS-CHALMERS

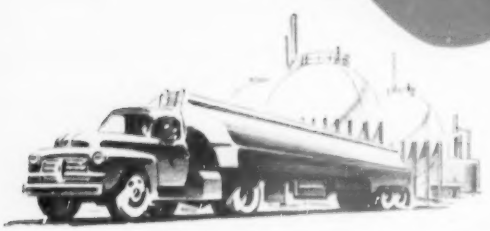
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Eaton 2-Speed Truck Axles

POWER WHEN NEEDED, SPEED WHEN WANTED

MORE AND QUICKER FULL-LOAD TRIPS

LOWER OPERATING AND MAINTENANCE COSTS



More than two million
Eaton Axles in trucks today!
For complete information, see your truck dealer.

EATON

AXLE DIVISION

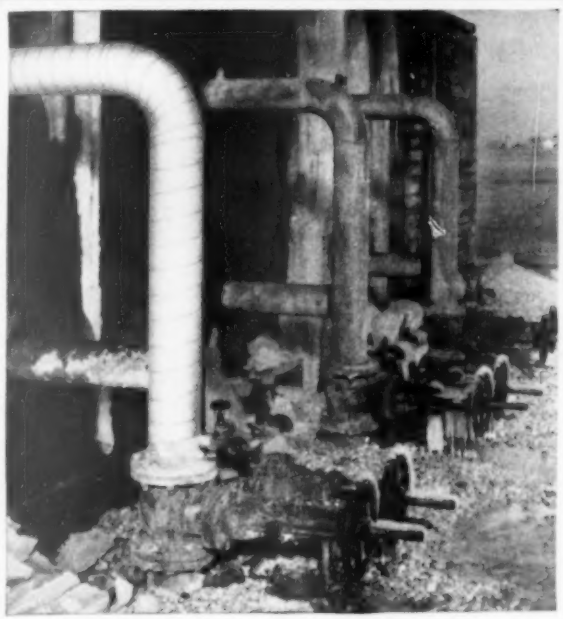
MANUFACTURING COMPANY

CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Experience Proves

Polyken TAPE GIVES BETTER CORROSION PROTECTION



1 On Michigan-Wisconsin Pipe Line Co. cooling tower, *Polyken* protected pipe on left has outlasted pipes on right 3 to 1 with no sign of wear.

2 Hoffman and Jacobs, Long Beach, California, coat underground conduits faster, easier, and more economically with a single wrap of *Polyken* tape.

3 In plants where direct chemical attack causes corrosion, *Polyken* polyethylene tape coatings prove their superior corrosion-resistant qualities.

1. *Above ground* where age, temperature and atmosphere are the destructive corrosive elements.
2. *Under ground* where protection is needed against electrolytic and chemical attack in addition to bacterial and fungus growth.
3. *Indoors* where direct chemical attack causes corrosive deterioration.

Resists external corrosive forces in all types of pipe installations

Polyken tapes are the new, proven method to fight corrosion. In actual tests both in the laboratory and in the field, *Polyken* tapes outperform other protective coatings on many types of jobs . . . and here's why:

Controlled manufacture of pre-formed plastic film. Same even over-all thickness assures a more uniform, longer lasting protective coating. Free of the variables that characterize other coating applications.

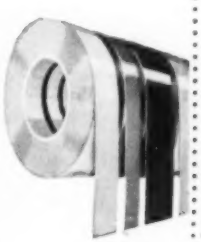
Extra-heavy Polyethylene coating. Consists of 8-mils of a tough, oriented plastic film that is recognized for its excellent dielectric strength, water and chemical impermeability, and resistance to bacterial and fungus growth.

Thick adhesive mass. Actually a stable protective barrier in itself. ¼-mil layer of adhesive that provides a superior bond to all metal surfaces, penetration of surface voids, and excellent bonding adhesion on overlaps.

Easily applied. One man can wrap it on pipe tightly and evenly right from the roll. Requires no heat, liquids, solvents, or thinners. No drying time, clean-up time, or shut-down time.

Whatever your corrosion problem, rely on *Polyken* tapes for the safe, permanent, economical answer. Mail the coupon for FREE samples and complete information.

Polyken®
PROTECTIVE COATINGS
POLYKEN PRODUCTS DEPARTMENT OF THE KENDALL COMPANY



Polyken, Dept. OG-D
222 West Adams St., Chicago 6, Illinois

Please send me samples and further information on *POLYKEN* No. 900 and 910 PROTECTIVE TAPE COATINGS.

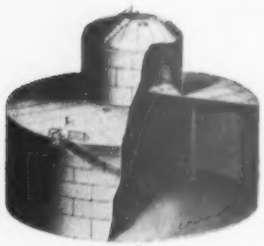
Name_____ Title_____

Company_____

Street Address_____

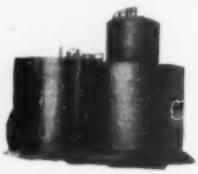
City_____ Zone_____ State_____

the HAMMOND DIALIFT*



MONEY SAVER FOR PRODUCT-STORAGE OPERATORS!

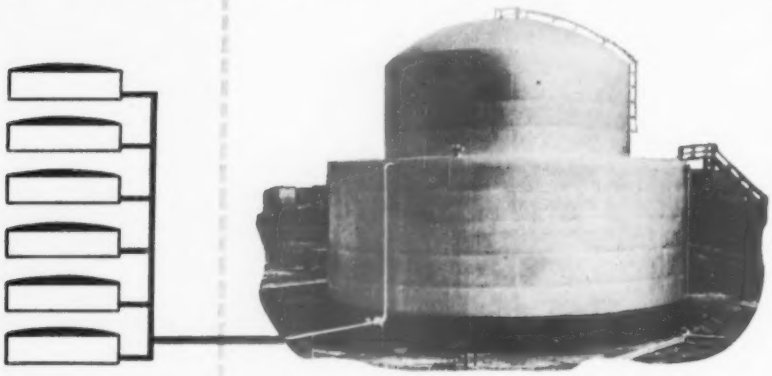
The Hammond DIALIFT is the modern tank for eliminating breathing losses and reducing filling losses. It gives maximum conservation of vapors at lowest cost.

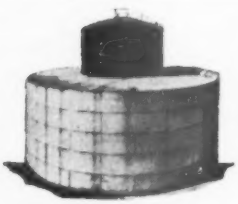


42'6" x 40' Liquid Storage Tank 22' x 17'9" Dialift. Housing — 6500 cu. ft. capacity Inter connected to a 25' x 40' Cone Roof Tank

50' x 48' Liquid Storage Tank 30' x 15'9" Dialift. Housing — 12,500 cu. ft. capacity

The DIALIFT consists of a tubular membrane attached gas-tight to the inside periphery of a cylindrical housing. In operation the DIALIFT functions as the lung of the storage tank. The membrane lifts under a slight pressure when additional vapor storage space is needed, and lowers when less vaper space is required; self-adjusting to the constantly changing breathing conditions within the tank.





80' x 30' Liquid Storage Tank 35' x 17'9" Dialift. Housing — 20,000 cu. ft. capacity

It is easy to convert an existing Cone Roof Tank to an efficient DIALIFT installation. A DIALIFT housing is superimposed on the existing roof, breather holes are installed through the roof plating permitting a free passage for all vapors, no other preparation is necessary.

60' x 48' Ground Type Dialift. 150,000 cu. ft. capacity

*patented

Bulletin 53DL details and describes the Hammond Dialift . . . *Write for your copy.*

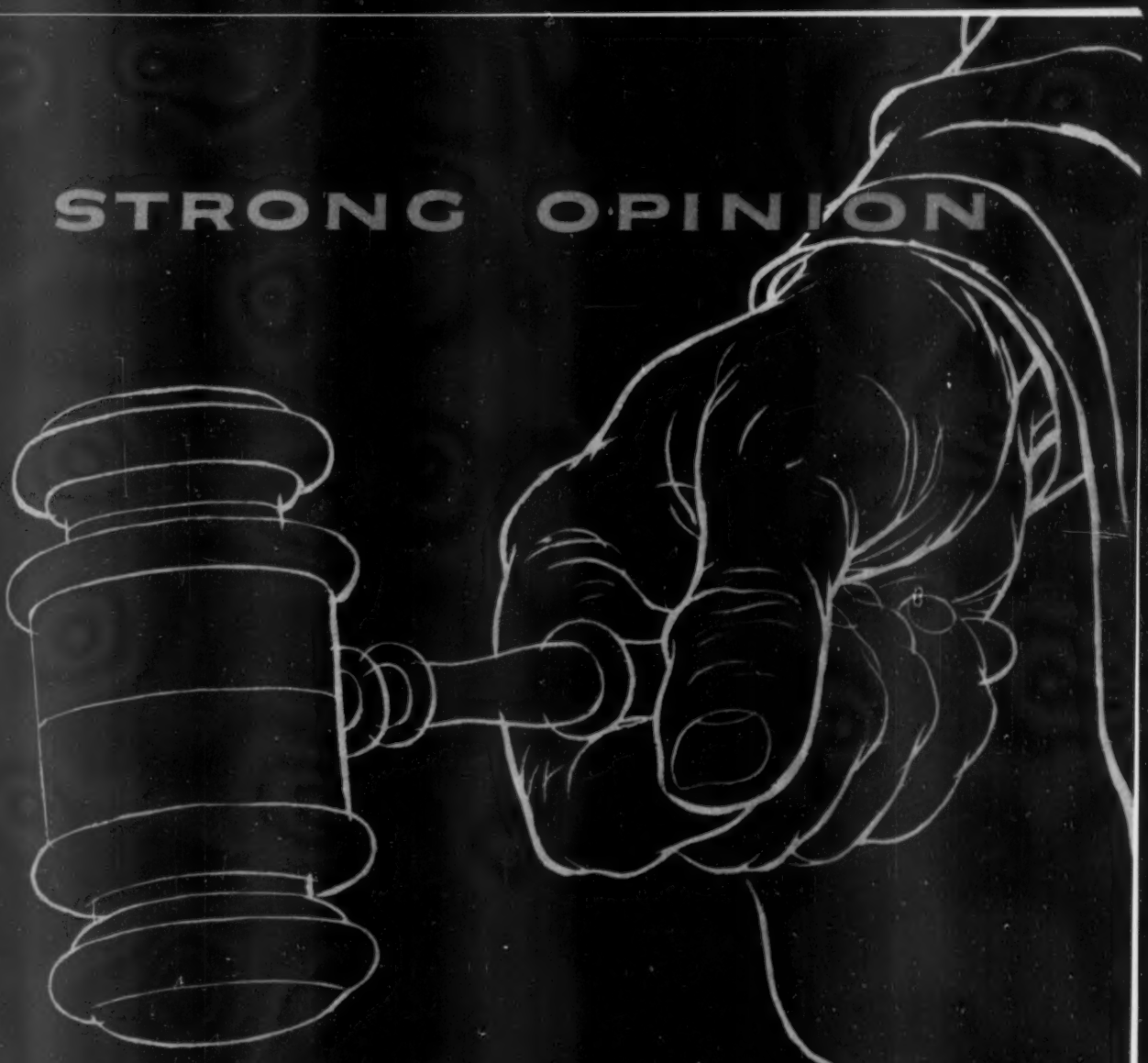
HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH • CASPER, WYO. • BIRMINGHAM, ALA.

Sales Offices: NEW YORK 20 • AKRON • BOSTON 10 • BUFFALO 2 • CHICAGO 3 • CINCINNATI 2 • CLEVELAND 15 • EL PASO • HOUSTON 2 • LOS ANGELES 14 • PITTSBURGH 19 RICHMOND 20 • SAN FRANCISCO • WASHINGTON 6, D.C. • HAVANA • "TIPSA" BUENOS AIRES

ON THE PACIFIC COAST BY LACY *MFG. CO. • LOS ANGELES, CAL. • IN CANADA BY* VULCAN *IRON & ENG. LTD. • WINNIPEG*

STRONG OPINION



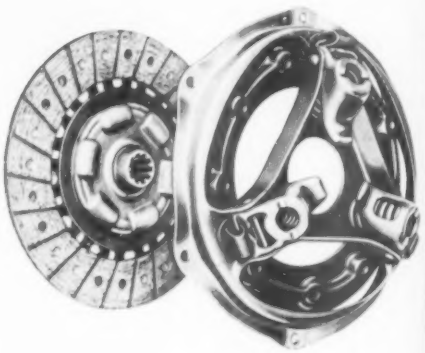
Strong opinion . . . mighty strong . . . is that which comes from a great majority and says:

"We believe in you . . . in what you have done . . . in what you are doing. We prefer your products and your principles."

Spicer has concentrated on the invention, development and perfection of power transmission units for 50 years. Today, the use of Spicer equipment for efficient application of horsepower is standard in almost every type of automotive vehicle. Ten great and modern plants are efficiently equipped to serve the industry's needs.

THIS IS THE AUBURN CLUTCH DIVISION AT AUBURN, INDIANA

Thousands of Spicer Brown-Lipe and Auburn Clutches are produced daily in the Auburn Clutch plant, for use in many popular automobiles, trucks, buses, tractors, and industrial applications.



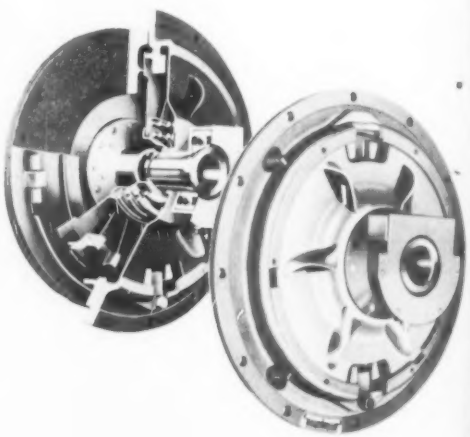
Millions of Auburn Clutches in Active Daily Service

Auburn Clutches have been approved and accepted as original equipment since 1937. They are manufactured in a new, modern plant, fully staffed and equipped with the most modern tools and systems for an annual capacity of over a million complete clutch assemblies.

Major features include:

25% Less Weight • 30% Fewer Parts
Runs Cooler • Longer Pressure Spring Life
Torsional Vibration Damper • Patented Flexible Center
Patented Cushion Eliminates Chatter
New Positive Pressure Plate Return • Wide Range of Sizes

The Brown-Lipe Clutch Offers Outstanding Performance for Heavy-Duty Trucks and Buses



Features include:

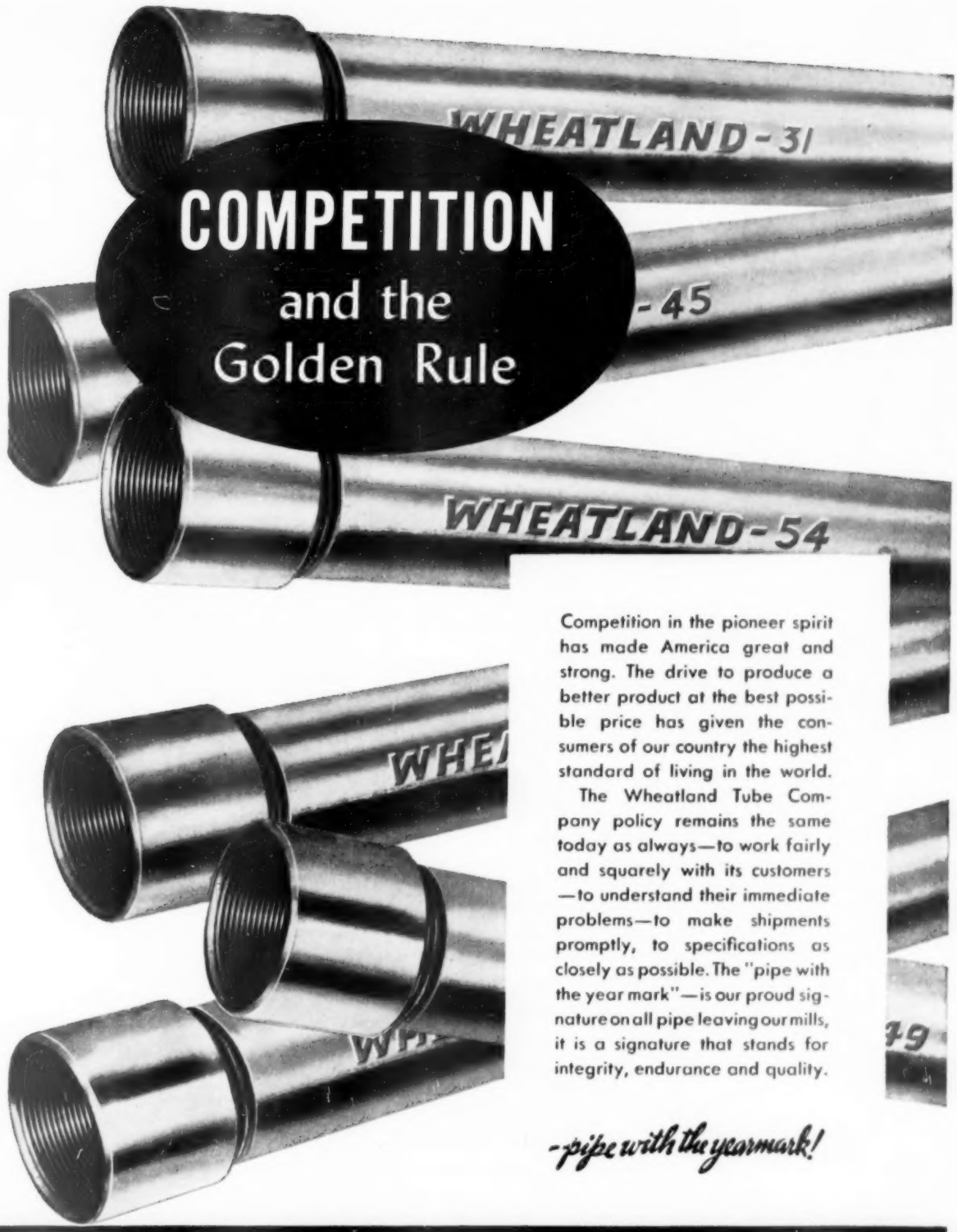
INSULATED SPRINGS. Not in contact with pressure plate; heat from plate cannot destroy their temper.
UNIFORM OVERALL PRESSURE. Through 360° of pressure plate.
SIMPLE SCREW THREAD ADJUSTMENT. Permits quick, easy adjustment.
SMOOTH. Flexibility of levers results in smooth pick-up.
NO CHATTER. Assures longer life.
LOW PEDAL PRESSURE. Remains essentially constant throughout clutch life.
FEWER PARTS. Greater efficiency with less upkeep.
ECONOMICAL. Low maintenance cost. Long-life performance.

SPICER MANUFACTURING DIVISION
of Dana Corporation • Toledo 1, Ohio

50 YEARS OF Spicer SERVICE

ENGINEERING DANA MANUFACTURING

TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • BROWN-LIPE AND AUBURN CLUTCHES • FORGINGS • AXLES • STAMPINGS • SPICER BROWN-LIPE GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • AIRCRAFT GEARS • WELDED TUBING



COMPETITION and the Golden Rule

Competition in the pioneer spirit has made America great and strong. The drive to produce a better product at the best possible price has given the consumers of our country the highest standard of living in the world.

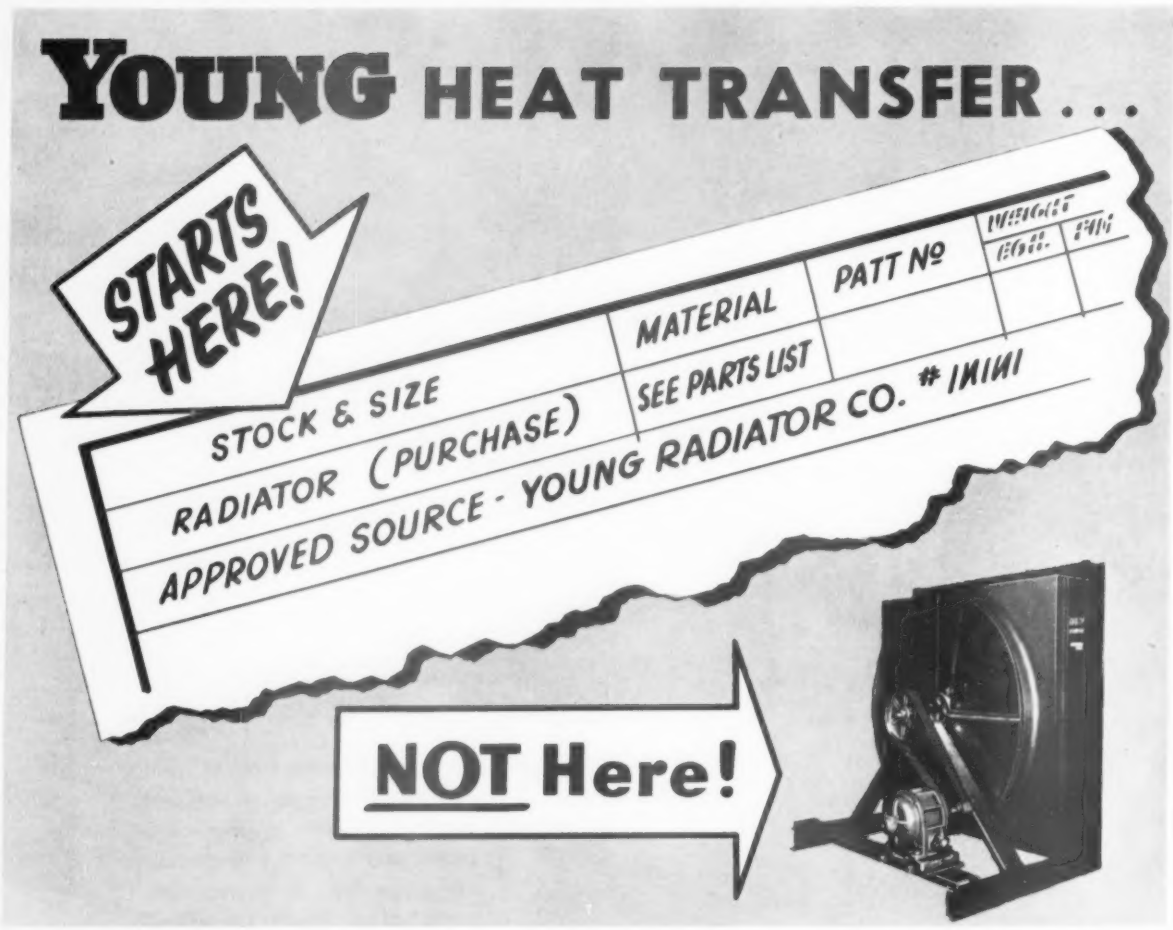
The Wheatland Tube Company policy remains the same today as always—to work fairly and squarely with its customers—to understand their immediate problems—to make shipments promptly, to specifications as closely as possible. The "pipe with the year mark"—is our proud signature on all pipe leaving our mills, it is a signature that stands for integrity, endurance and quality.

-pipe with the yearmark!

WHEATLAND TUBE COMPANY

Bankers Securities Building Juniper & Walnut Sts., Philadelphia 7, Penna.

YOUNG HEAT TRANSFER . . .



WHERE ENGINEERING IS A DEDICATION . . . NOT A DEPARTMENT!

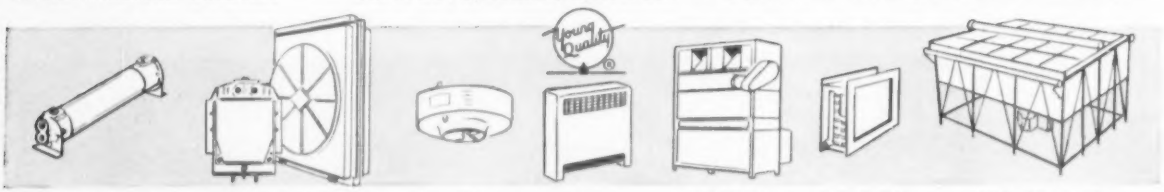
One of the several rewards Young Heat Transfer Specialists receive is this ever repeating tribute appearing on customer drawings . . . "APPROVED SOURCE, YOUNG RADIATOR COMPANY." Customers base their preference on Young's more than 25 years of experience in this highly specialized science . . . and upon trained personnel teamed with management pioneers in the field. This gratifying association of Young and its customers increases with the spontaneous dedication of Research and Engineering to produce the ultimate in Heat Transfer Equipment. For further information on Young Heat Transfer Products, see the Young Representative listed in the "Yellow Pages" of your Telephone Directory, or write without obligation.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 204-D, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.

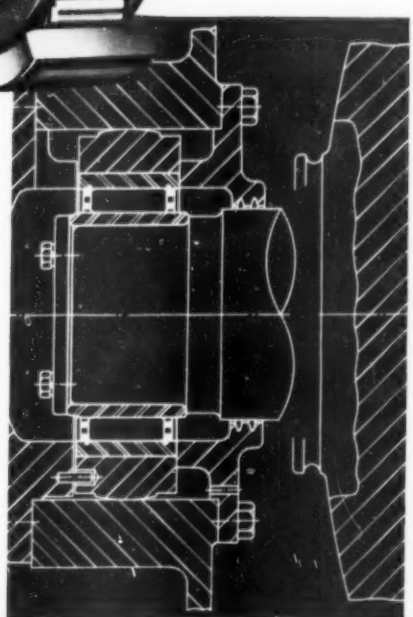


Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

Is shaft expansion a problem?

HERE'S HOW HYATTS HELP...

Hyatt Hy-Loads are available in separable outer race, separable inner race or non-separable construction.



Check the drawing at the left. The bearing is a Hyatt Hy-Load, and because the inner race is cylindrical, the shaft it supports is free to move axially—thus allowing for shaft expansion without cramping the bearing or distorting the shaft. Obviously, this is only one of many ways in which Hyatt bearings can be used to reduce costs as they reduce friction, but it's a good example of why so many designers throughout industry keep their Hyatt catalogs within easy reach.

For further details write for Catalog 150 or call your nearest Hyatt representative.

HYATT ROLLER BEARINGS

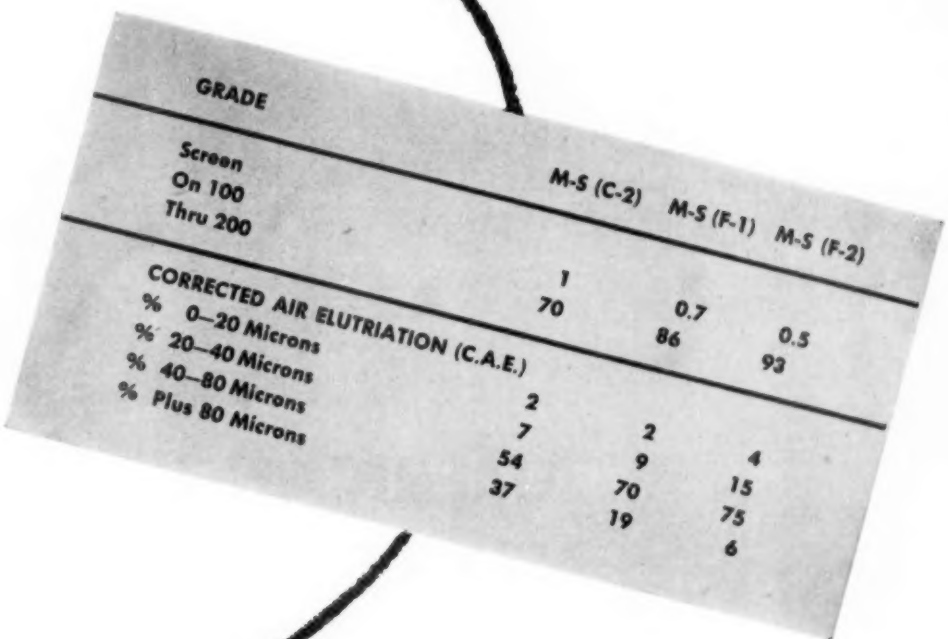
STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

How much of your active catalyst is lost because of particle size?

How many of your difficulties can be attributed to coarse catalyst?

Progress Through Chemistry
THE DAVISON CHEMICAL CORPORATION
BALTIMORE 3, MARYLAND
PRODUCERS OF CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES,
PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES
SOLE PRODUCERS OF DAVCO GRANULATED FERTILIZERS



GRADE	M-S (C-2)	M-S (F-1)	M-S (F-2)
Screen			
On 100	1		
Thru 200	70	0.7	0.5
		86	93
CORRECTED AIR ELUTRIATION (C.A.E.)			
% 0–20 Microns	2		
% 20–40 Microns	7	2	
% 40–80 Microns	54	9	4
% Plus 80 Microns	37	70	15
		19	75
			6

an outstanding characteristic of DAVISON'S M-S® catalysts

are their narrow range of particle size distribution. There is a minimum of fines—a minimum of coarse. This is important to you!

The fines in your fresh active catalyst may be lost because the unit is unable to retain them. Coarse catalyst has an adverse effect on catalyst circulation . . . bed density . . . regeneration . . . fluidization.

Here are typical production analyses of Davison M-S Catalysts. One of these grades should fit into your operations. For help in selecting your catalyst or other information call your Davison Field Service Engineer or write.

AMERICAN-LA FRANCE NEW DRY CHEMICAL FIRE EXTINGUISHERS

When fire hits, these new American-LaFrance Dry Chemical models are ready to stop it. Simply pull pin and squeeze lever. No gadgets to operate, no last minute pressurizing from a gas cartridge or cylinder, no inverting, no bumping, no shut-off nozzle on the hose needed. They're ready to go!

Their fire-smothering efficiency is aided by a scientifically designed Discharge Nozzle which fans the Dry Chemical downward in wide pattern and with great density. Their 150 (plus 25 minus 0) psi. air (or nitrogen) pressure maintains uniform duration of the Dry Chemical discharge pattern.

A glance at valve gauge indicates whether unit is in operating order. When partially operated, the extinguisher can be left standing without loss of air pressure, for use on a possible reflash.

The American-LaFrance Dry Chemical Valve is completely new also. It is ruggedly built. No special tools needed. Contains few parts. Equipped with Safety Relief Valve. Complete valve and siphon tube assembly removes as a single unit for recharging. They're watertight, and corrosion resistant. Tested for vibration and for operation at temperatures from minus 40° F. to plus 150° F. A Moisture Trap provides for pressurizing with air. Write for free illustrated literature.

Approved by Underwriters' Laboratories for Class B and C fires.

Half a Century of Leadership in FIRE PROTECTION

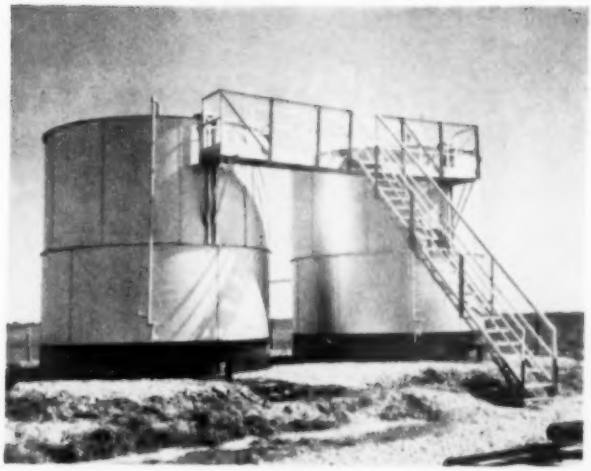
AMERICAN-LAFRANCE-FOAMITE Corporation

ELMIRA · NEW YORK · U.S.A.

IN CANADA, LAFRANCE FIRE ENGINE & FOAMITE LTD., TORONTO

A1FCO

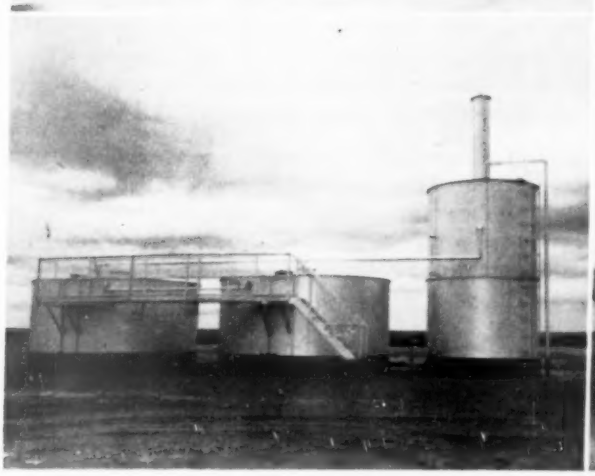
Best of Materials and Craftsmanship

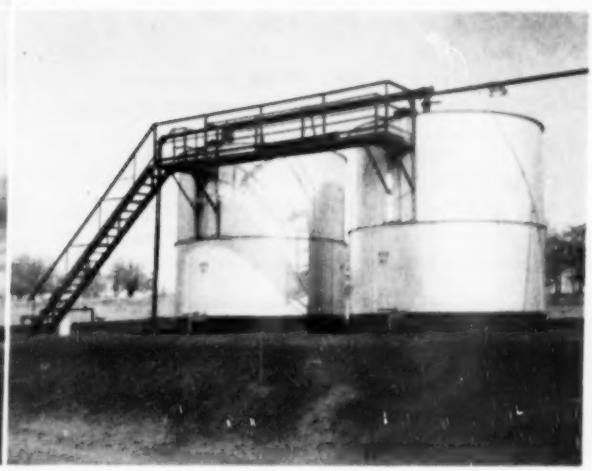


Make Maloney-Crawford Bolted Steel Tanks

SUPERIOR

Over 40 years experience (since building the original bolted steel tank) is built into every Maloney-Crawford tank. This engineering and building experience plus the best in current craftsmanship and constant inspection from start to finish is your assurance of quality when you buy Maloney-Crawford Tanks.





MALONEY CRAWFORD

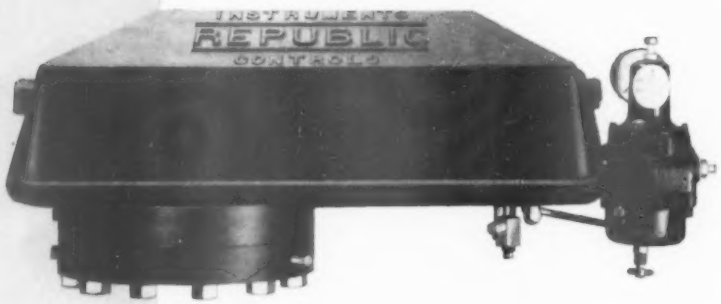
MALONEY-CRAWFORD TANK & MFG. CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659, Tulsa, Oklahoma.
EXPORT REPRESENTATIVE: Baird Lines, 420 Lexington Avenue, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd., Edmonton.
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas.

COMBINES MACHINE RUGGEDNESS WITH INSTRUMENT PRECISION for dependable low maintenance metering

REPUBLIC

pneumatic transmitter for measuring FLOW, PRESSURE, LEVEL or DENSITY...



Machine dependability with instrument accuracy and sensitivity! Think what this combination of features can mean in your plant—less maintenance, longer life for lowest "long run" cost, *continuous* accurate operation.

You get all of these benefits and more with the Republic Pneumatic Transmitter. Force-balance operation permits the use of strong rugged parts with no sacrifice in accuracy or sensitivity. Gives exceptional overrange protection.

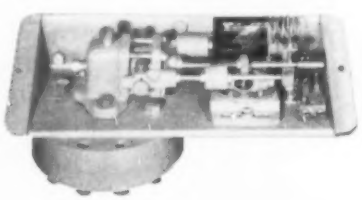
Housed in a durable metal case, the transmitter may be adjusted for mounting at any angle, indoors or out. Its accuracy is not affected by changes in ambient temperature vibration, normal changes in supply air pressure or inaccurate leveling. Uses no mercury or purge pots. Can be used with very viscous fluids.

The Republic transmitter isolates fluids to a measuring chamber which may be supplied in a variety of corrosion resistant materials. It sends an air pressure proportional to fluid flow, pressure, level or density to reading instruments or for actuation of an automatic controller.

Republic Pneumatic Transmitters are proving their superiority in hundreds of chemical and oil field applications. Investigate their advantages for you — write for your free copy of 36 page Data Book No. 1004.

SPECIFICATIONS:

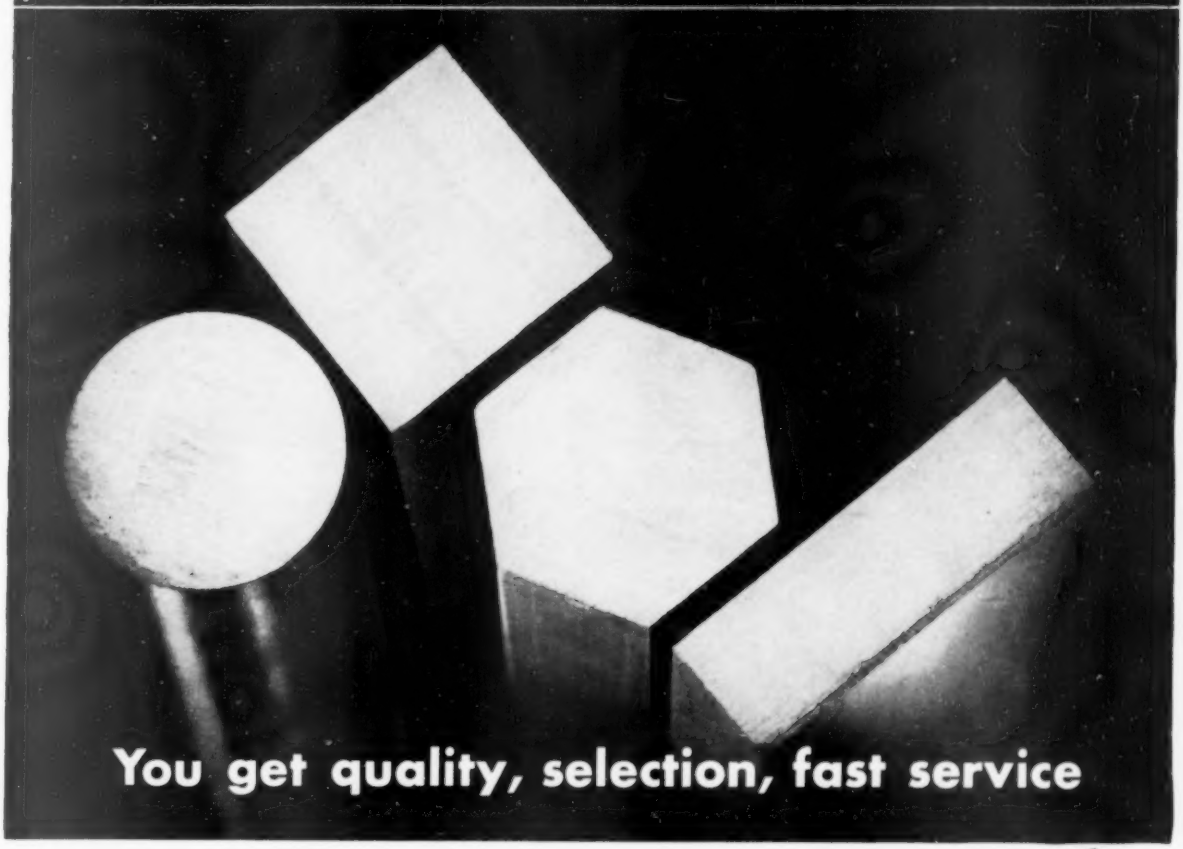
ACCURACY — ½% of maximum range guaranteed for standard models.
DIFFERENTIAL RANGES — Any desired span between 0-0.6" H_2O and 0-750 psi at operating pressures of 15 psig to 2000 psig.
PRESSURE RANGES — Any desired span between 0-1" H_2O and 0-2000 psig.
LEVEL RANGES — to meet almost any application.
DENSITY RANGES — 0.15 sp. gravity spread for 3 to 15 psig output pressure from any base density.
Extremely wide range change is possible without change of parts. Ranges may be easily changed, suppressed, compounded or reversed.



● ***EASILY SERVICED*** **Cover can be completely removed for access to all range adjustments and replaceable parts. No special tools required.**

REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

WHY IT PAYS TO BUY COLD FINISHED BARS FROM US



You will save money buying your cold finished bars from U.S. Steel Supply. We carry complete stocks of all the shapes and sizes that are in common demand. All are manufactured from the world's leading quality steel—United States Steel. And we will work closely with you to select exactly the right quality for your requirements—and the right quality is *not* always the most expensive.

You needn't tie up money and space in large inventories of cold finished bars . . . we can quickly supply whatever you need. Call us for: cold finished rounds, squares, hexagons, flats and precision shafting in all grades; cold finished screw stock, Bessemer rounds, "MX" high speed screw stock.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY
DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

Warehouses and Sales Offices
Coast to Coast

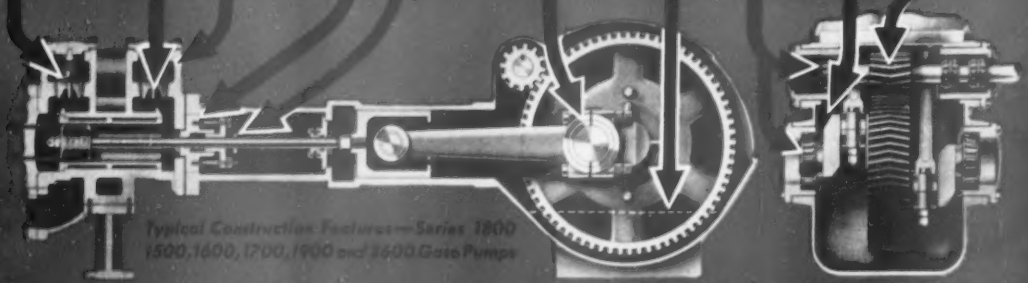
USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

10 POINTS That Spell

D U R A B I L I T Y

- DURABLE FREE MOVING VALVES
- LARGE VALVE OPENINGS
- INDIVIDUAL VALVE CHAMBERS
- DEEP STUFFING BOXES
- NO OVERLAPPING OF RODS
- BABBITT LINED SHELL BEARING
- FLOOD LUBRICATION
- LARGE ROLLER BEARINGS
- ALLOY STEEL CRANKS
- ALLOY STEEL LAPPED HERRINGBONE GEARS



Typical Construction Features—Series 1800 1500, 1600, 1700, 1900 and 2600 Gaso Pumps

Here is the real secret of Gaso supremacy in pipe line pumps. It's engineering—engineering that starts with molybdenum alloy cast-iron with a tested tensile strength of 45,000 to 48,000 pounds per square inch, and extends to every detail of design. To specify Gaso is such a simple way to be SURE of the extra life and performance that sound engineering represents.

GASO PUMP & BURNER MFG. CO.

TULSA, OKLAHOMA

EXPORT OFFICE: 149 Broadway, New York

LUFKIN MACHINE CO., Ltd., Edmonton, Alberta

W. L. SOMMER COMPANY, Shreveport, Louisiana

Tinsley, Mississippi • Brookhaven, Mississippi • Odessa, Texas

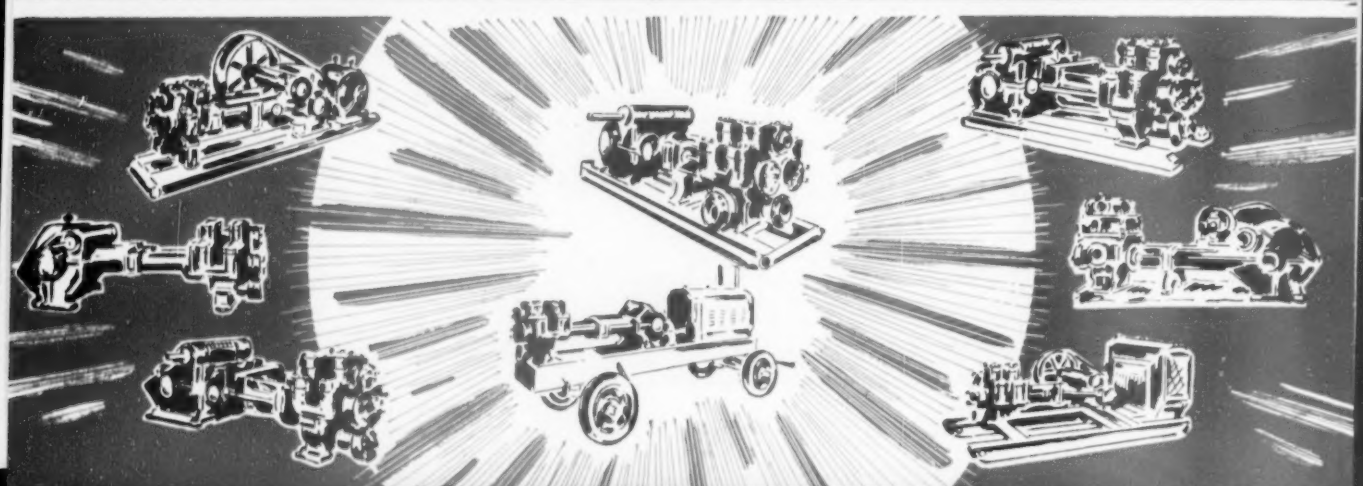
BUDA ENGINE & EQUIPMENT CO., Los Angeles, Calif. • Long Beach, Calif. • Bakersfield, Calif.

PEDDLERS, INC., Houston, Texas

MORTEX ENGINE & EQUIPMENT CO., Wichita Falls, Texas

GASO PUMPS

for every oil industry need



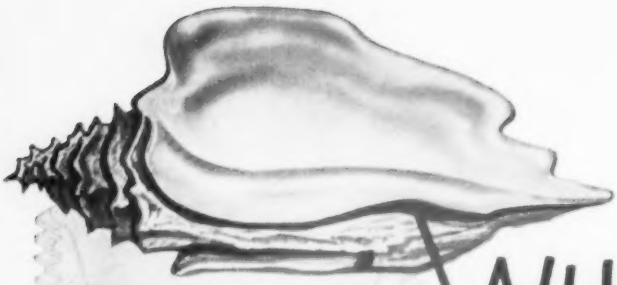
28,601 Years of Chemical Experience

The skills acquired through experience are happily blended with the vigor and ambitions of youth throughout the Columbia-Southern organization. ¶ Nearly a third of all Columbia-Southern personnel have been with the company from ten to forty-five years. In the aggregate, the Columbia-Southern staff has had 28,601 years of experience! These people know the chemical business — and they understand the requirements of customers. ¶ Equally important, however, are the many fine younger members of the Columbia-Southern organization whose developing talents and abilities are assurance of continuing progress and adherence to high standards through the years ahead.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

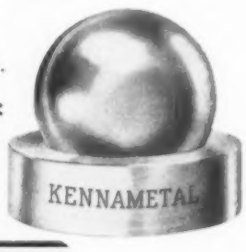
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA



WHAT A LIFE!

This conch shell spends its life in some of Nature's most persistently destructive elements—sand and salt water. And it successfully combats the constant attacks of these elements because of a high resistance to corrosion and abrasion.



KENNAMETAL*

BALLS and SEATS

Like conch shells, Kennametal Balls and Seats last longer in highly corrosive and abrasive elements. Their service life in flour sand cut fluids, hydrogen sulfides, and sulfur far surpasses that of any of the "special" alloys. Operators are able to get more than 5 times longer valving service. Risk of bottom-hole valve failure is further reduced by Kennametal design features such as the "triple bevel" (shown on the seat at left), which increases shock resistance and provides a "funneling" action that keeps foreign matter from lodging in the seat.

If you have a "problem" well, remember to ask about Kennametal Balls and Seats. They are installed in the repair shops of most major pump manufacturers.

*Registered Trade Mark

KENNAMETAL*

REDUCES THE RISK OF SUB-SURFACE VALVE FAILURE

Quality Sintered Carbide API Balls and Seats

Manufactured by

Kennametal Inc., Latrobe, Pa.

SOLD BY MAJOR PUMP MANUFACTURERS

"rough country"

Inch by inch best describes the laying of this pipeline through the most rugged kind of rocky terrain. Every foot of this ditching had to be blasted with explosives or broken up by pneumatic jackhammers before the pipe could be put underground.

A job like this is tough on pipeline coatings too. Only the best type of protection will take such abuse. That's why Barrett Coal-Tar Coatings were used on this line. Through soft mud or hard rocks, Barrett Coal-Tar Coatings are designed to provide the best all-around protection you can get. It is significant that a Barrett Protective Coating will prolong the life of steel pipe indefinitely while increasing its cost by only a small fraction. And when you specify Barrett you get the finest protective coatings plus expert technical assistance.

The Barrett Technical Service Group is always ready to assist right from the blueprint and planning stage until the last foot of pipe has been laid. They help in the selection of the right high-quality coating which will give top protection yet keep costs to a minimum. In the field the Barrett Service Representative is right on the job—checking, advising and supervising preparation of the pipe and application of the coating right to the end of the line.

We welcome the opportunity to place the Barrett Technical Service Group at *your* service. For detailed information—phone, write, wire Barrett.

Approved Barrett Applicators are available for field or special work throughout the country. BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector St., N. Y. 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

Allied Chemical

1854 1954 CENTENNIAL Barrett 100 YEARS OF EXPERIENCE

BARRETT PROTECTIVE COATINGS

CHEMICAL PROGRESS WEEK, MAY 17-22

Quality...

where you need it most

LUNKENHEIMER

POP SAFETY and RELIEF VALVES

Abnormal overpressures are dangerous in any vessel — boiler, compressor, engine cylinder, or pump. That's why you need *outstanding* quality in Pop Safety or Relief Valves that keep overpressures from developing. Not only are they important in preventing interruptions of service — but they may save lives and damage to expensive equipment. That's why it pays to insist on *Lunkenheimer quality* when you specify or buy Pop Safety and Relief Valves for any service. Lunkenheimer design, materials, and workmanship are world-famous for excellence. Their record of performance is unsurpassed.

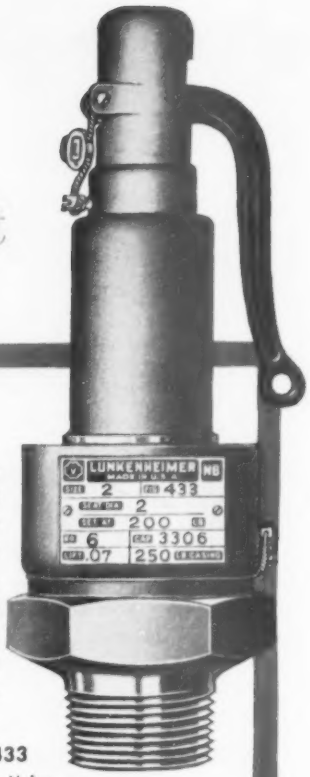


Fig. 433
Pop Safety Valve

THE DIFFERENCE BETWEEN POP SAFETY AND RELIEF VALVES

Pop Safety Valves are used in conjunction with gases, including steam. They pop wide open when the set pressure is reached, stay open until pressure has dropped . . . then snap shut instantly. **Relief Valves** are used in conjunction with liquids. They start to open at the set pressure but require about 20% overpressure to open wide. As pressure drops, they start to close and shut tight when the set pressure has been reached.

Fig. 658
Relief Valve

LUNKENHEIMER
L
QUALITY

WRITE FOR CIRCULAR 502, which describes the complete Lunkenheimer Line of 21 different Pop Safety and Relief Valve Patterns, each available in a wide range of sizes and pressures. Ask your Lunkenheimer Distributor or write The Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.

The Price of a Lunkenheimer Valve Gets Smaller and Smaller and Smaller with Every Passing Year of Dependable Service.

BRONZE . IRON . STEEL

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-254-3

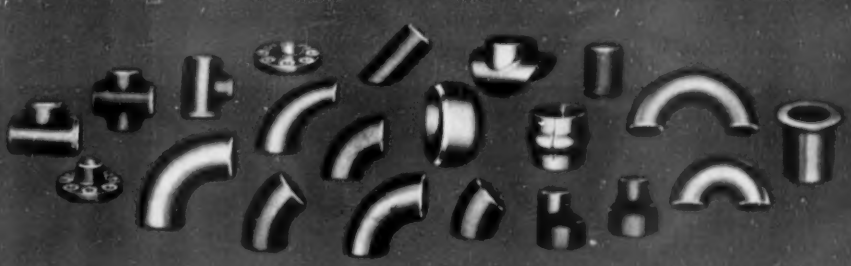
SIMPLE and EASY TO USE

Midwest Reducing Elbow replaces two fittings (1) a straight size elbow and (2) a reducer. One weld is eliminated with a resultant saving in layout time, welding, and cost. Pressure drop is reduced, appearance is improved and the piping is easier to insulate. Sizes to 16", reductions to half size.

Children get the hang of a bubble pipe almost by instinct . . . it's so simple and easy to use. Pipe welders report that they find Midwest Welding Fittings simple and easy to use because they are so uniform . . . so accurate to dimension . . . and because of their greater variety. Representative of this greater variety is the Midwest Reducing Elbow (shown at right) which takes the place of a standard elbow and a reducer . . . requires only two welds instead of three. For more information on why Midwest Welding Fittings are simple and easy to use, ask for Catalog 54.

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS



MIDWEST
WELDING FITTINGS
Improve Piping Design and Reduce Costs

Twin Staynew

LIQUID FILTERS *on the job in Gustin-Bacon Manufacturing Company's Kansas Plant*

Treated water used to cool transformers, busbars, bushings, and bushing terminals in the Gustin-Bacon Manufacturing Company's plant at Kansas City must be kept free of all foreign matter to insure uninterrupted around-the-clock operation.

Since the installation of these giant bronze fitted ELS Liquid Filters in the circulating cooling water system, down time due to cooling tube and orifice stoppage has been eliminated.

DOLLINGER PROTECTED MOTOR STAYNEW FILTERS

DOLLINGER

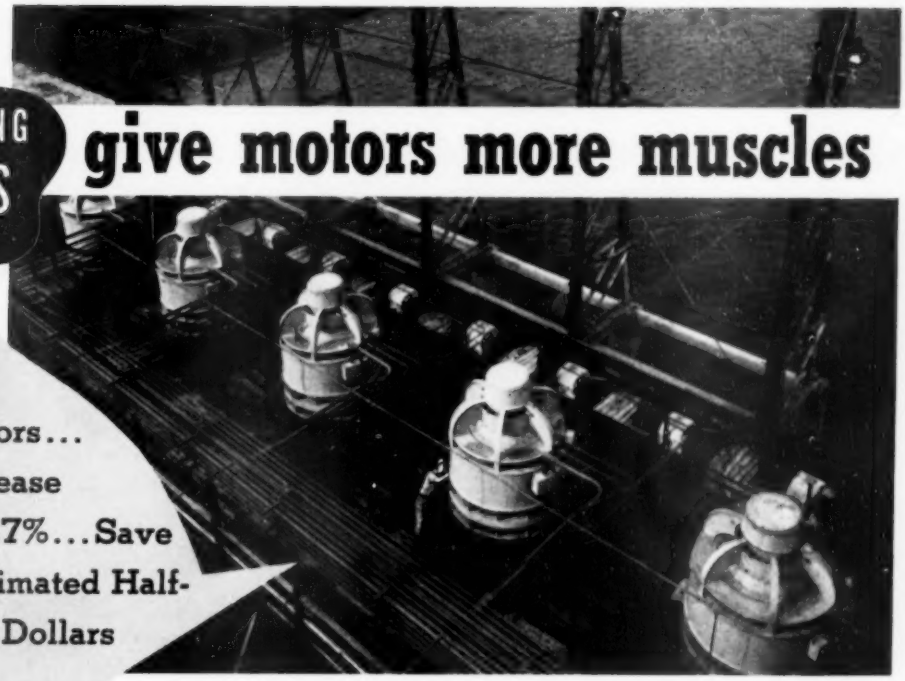
CORPORATION

5 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

DOW CORNING
SILICONES

give motors more muscles



Uprate pump motors... increase capacity 27%... Save an Estimated Half-Million Dollars

Much of the sea water pumped into The Dow Chemical Company's famous "magnesium from the sea" plant in Freeport, Texas, is handled by six 71,000 gpm centrifugal pumps. Each pump is direct-driven by a 300 hp, 277 rpm motor. The entire line of motors is mounted on a massive underwater concrete foundation.

Recently Dow's plant expansion program reached the point where a pumping capacity of 90,000 gpm per unit was required. That capacity could be reached by 450 hp motors operating at a higher speed. But conventional motors rated at 450 hp would be almost half again as large, and much heavier than the existing units. Extensive changes in mounts, brackets and other fittings, as well as reinforcement of the underwater foundations would be required. Estimates of the cost of reinforcing the foundations alone ran as high as a half-million dollars. And that's not counting the cost of the new motors or the fact that the work would have to be done all at once, shutting off the intake canal and all but halting plant production.

Dow engineers solved the whole problem at minimum cost by having the motors rewound, one at a time, with silicone (Class H) insulation to develop 450 hp at 327 rpm. Capacity of each pump was increased to 90,000 gpm without any further modification of the installation.

An extra advantage of Class H insulation was demonstrated when one of the motors was removed to correct a shaft rub that had developed at the upper seal. This same motor had also developed a small leak in its upper housing. When the motor was disassembled, the bottom ends of the coils were found to be immersed in 25 gallons of rain water. And still the silicone insulated coils remained in good operating condition.

That's the kind of performance that has convinced management, maintenance and design men that they get maximum life and reliability at minimum cost when they specify Class H insulation made with Dow Corning silicones for hard-working motors, transformers and other electrical equipment.

mail this coupon today!

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

Dow Corning Corporation, Dept. DS-16, Midland, Michigan

Please send me

- ☐ More performance data on Class H
- ☐ List of Class H rewind shops
- ☐ List of Class H Motor and ☐ Class H Transformer Manufacturers
- ☐ "Tall Tales and Fabulous Facts" about silicone products

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D.C. (SILVER SPRING, MD.)

Canada: Dow Corning Silicones Ltd., Toronto • Great Britain: Midland Silicones Ltd., London • France: Cie. St. Gobain, Paris

Serving
THE OIL & GAS INDUSTRIES WORLD-WIDE

Casper, Wyoming

Victoria, Texas

Maracaibo, Venezuela

From Canada through the Rocky Mountains . . . the Mid-Continent . . . the Gulf Coast . . . and into the South American Fields, Continental facilities are constantly being expanded and improved to better service its valued customers.

The three stores pictured above are typical of this service expansion. At these points, along with the 87 other Continental stores and offices throughout the oil country, you will find available the quality products of Continental's associate manufacturers with dependable, Green Triangle service.

THE CONTINENTAL SUPPLY COMPANY

General Offices: DALLAS, TEXAS

Representatives in All Principal Oil Fields of the World

PUMP STRIPPER WELLS MORE PROFITABLY-

WITH Carter LONG-STROKE HYDRAULIC PUMPING UNITS

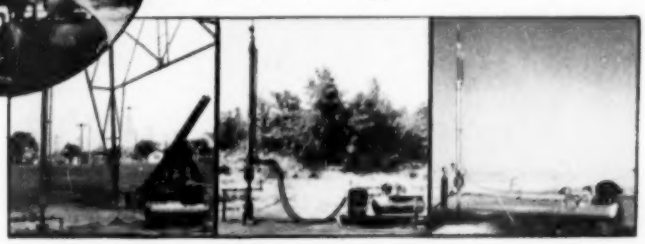
designed-built-priced FOR STRIPPER WELLS

SOUTH TEXAS: Production increased from 3½ bbl./day to 6 bbl./day on 2700' well in Duval County Area when Carter Unit replaced conventional equipment. Shown is one of 11 units owned by independent.

Actual records show that in many cases installation of Carter Units has caused substantial production increases. Long, slow upstroke and fast downstroke of Carter Units permit pumping at *nearly constant flow and with greatly improved overall efficiency.*

Some of the Specific advantages Carter Pumping offers you are: maximum production without pumping off or pounding fluid; accurate control of pumping rate; longer life of sucker rods and sub-surface equipment; reduction of costly down-time, better handling of gassy, sandy or viscous fluids; simplicity of operation and worthwhile savings in initial cost and installation.

With over 800 units now in service, some for as long as eight years, the Carter method is increasingly recognized by both majors and independents as the better way to produce stripper wells.



EAST TEXAS. One of 8 Carter Units owned by major in Kilgore-Turnertown Areas. Pumping allowable from 3500'. Total cost about 60% conventional unit cost.

OKLAHOMA. One of 7 Carter Units owned by independent in Tulsa Area, pumping from about 1500'. Operator reports production holding better than offsetting wells with conventional units.

WEST TEXAS. Carter Unit in Spraberry Area pumping from 7080'. Unit was installed for about 30% conventional unit cost.

Available in Seven Models to suit your specific requirements.

WRITE FOR BULLETIN PR-253

S. C. CARTER CO., INC.

1900 Santa Fe Avenue, Los Angeles, California

Sales and Service Representatives in: CALIFORNIA – Los Angeles, ILLINOIS – Robinson, Salem, INDIANA – Princeton, Evansville, KANSAS – Chase, El Dorado, Great Bend, KENTUCKY – Irvine, Oil Springs, Owensboro, LOUISIANA – Harvey, Houma, Lake Charles, New Iberia, Shreveport, MICHIGAN – Mt. Pleasant, MONTANA – Conrad, Cut Bank, OHIO – Wooster, Zanesville, OKLAHOMA – Healdton, TEXAS – Alice, Barbers Hill, Bay City, Beaumont, Borger, Columbus, Corpus Christi, Houston, Kilgore, Liberty, Monahans, Pampa, Victoria, WEST VIRGINIA – Vienna, WYOMING – Casper.

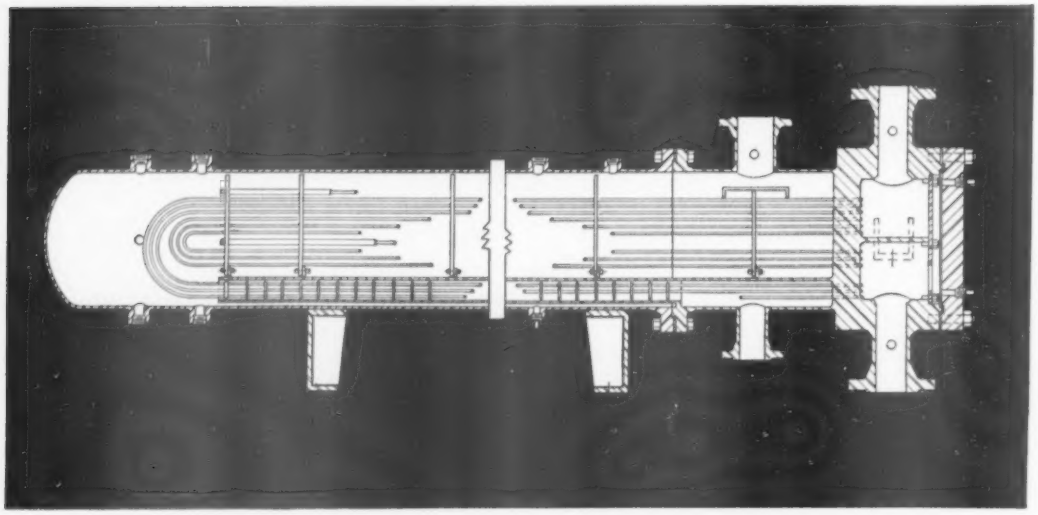
Export: Edmonton – Caracas – Maracaibo – Puerto La Cruz – Port of Spain

SUPERIOR FEEDWATER HEATERS

are BUILT to *YOUR* REQUIREMENTS

Superior's flexibility in the design of heads, shells, and tube bundles provides tailored units to meet every feedwater heating requirement. Any combination of desuperheating, condensing, or subcooling in a single heater.

Leak-proof pass partition sealing plates using pressure drop of feedwater to insure a positive seal. Controlled steam travel through heater by means of specially designed baffles minimizes tube erosion.



DESIGNED FOR MAXIMUM THERMAL EFFICIENCIES

The illustrated typical Superior feedwater heater incorporates the most modern features of design. The unit is one of a pair recently supplied a large user of feedwater heaters. The tube design pressure is 850 p.s.i.

The integral subcooling zone cools the drips to a temperature close to that of the incoming feedwater. This increases the thermal efficiency of the heater and reduces the flashing of the drips to the next lower heater, thereby minimizing the erosive effect on both the interconnecting piping and the tube bundle.

The pass partition plate in the head uses the pressure drop of the boiler feedwater through the tubes to prevent leakage between passes and thus increases the thermal efficiency.

Our Engineering Department invites your inquiry on any proposed application as a basis for a specific engineering recommendation. Write for catalog 6011.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
HEAT EXCHANGERS

Oil helps him keep us healthy...

What makes a doctor? Long years of learning, a deft pair of hands, eyes that see beneath the surface, a mind that must make life-or-death decisions in a clock's tick. Working hours: 24 a day. Responsibility: unlimited. Petroleum, so useful in so many fields, is helping the doctor, too. A lot of his "magic" aids – such as antiseptics, drugs, sedatives, dressings – are produced from this vital resource. Through continuous research and superior petroleum products, The Texas Company has long served our country's medical profession.

The Texas Company

TEXACO

they never get tired!
• YARWAY Single-end Welding-type Gun-Pakt joint for 150 lbs. pressure.
• Some of the 189 YARWAY Gun-Pakt expansion joints installed at large oil refinery in Texas.

No fatigue with 189 YARWAY GUN-PAKT EXPANSION JOINTS at this large Texas refinery

THEY just work and work for years and never get tired. Yarway Gun-Pakt slip-type joints simply will not fail through fatigue. They will operate smoothly, as frequently as required, over long, full traverse up to 12" single type or 24" double type or short, partial traverse, day in and day out—with never any danger of metal fatigue or failure.

This is just one of the many big advantages found in Yarway Gun-Pakt expansion joints. Other outstanding Gun-Pakt features are:

1. Can be serviced under *full* steam pressure day and night, thus avoiding costly and inconvenient shutdowns.
2. Fixed Gun-Pakt gland serves as "built in" external guide and permits less costly and rigid pipe guidance than required by many other types of joints.
3. Lower pressure load on end anchors because excessive strains are eliminated.

Used for many years with success in well-known refineries, industrial plants, utilities and institutions. When replacing present joints or planning new steam lines, it will pay you to look into the advantages of the Yarway Gun-Pakt expansion joint. Write for Yarway Bulletin EJ-1913.

YARNALL-WARING COMPANY
136 Mermaid Avenue, Phila. 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY

gun-pakt expansion joints

PROCON
"OFF-THE-SHELF" DESIGNS
MEAN **Earlier on-stream time**
Accurate cost estimates
Lower engineering costs
Purchasing know-how
Proved construction techniques
Experienced field construction staffs

PROCON Builds Platformer at Pana in 7 Months

Pana Refining Company, a division of the Illinois Farm Supply Company, turned to Procon for speedy construction of the first UOP Platforming unit in the state of Illinois devoted exclusively to the production of superior quality motor fuel.

From the time the contract was signed until Procon turned the completed pressure tested 650 B/SD unit, ready for operation, over to the refinery only seven months and seven days elapsed . . . further proof that "Built by Procon" is the refiner's assurance that his construction will be handled with maximum speed, efficiency, and economy.

Procon has a WIDE RANGE of "off-the-shelf" UOP Platforming units for refiners to choose from, ranging from 600 B/SD to giant 16,000 B/SD plants.

IT'S PLAIN GOOD SENSE for a refiner to use "off-the-shelf" designs when available. He thus has the assurance of earlier on-stream time, accurate cost estimates, lower engineering costs, purchasing know-how, proved construction techniques and experienced field construction staffs for his particular job.

PROCON *Incorporated*

PROCESS CONSTRUCTION

1111 MOUNT PROSPECT RD., DES PLAINES, ILLINOIS, U. S. A.

IN CANADA | PROCON (CANADA) LIMITED
68 YONGE STREET
TORONTO 1, ONTARIO

IN ENGLAND | PROCON (GREAT BRITAIN) LIMITED
112 STRAND, LONDON, W. C. 2

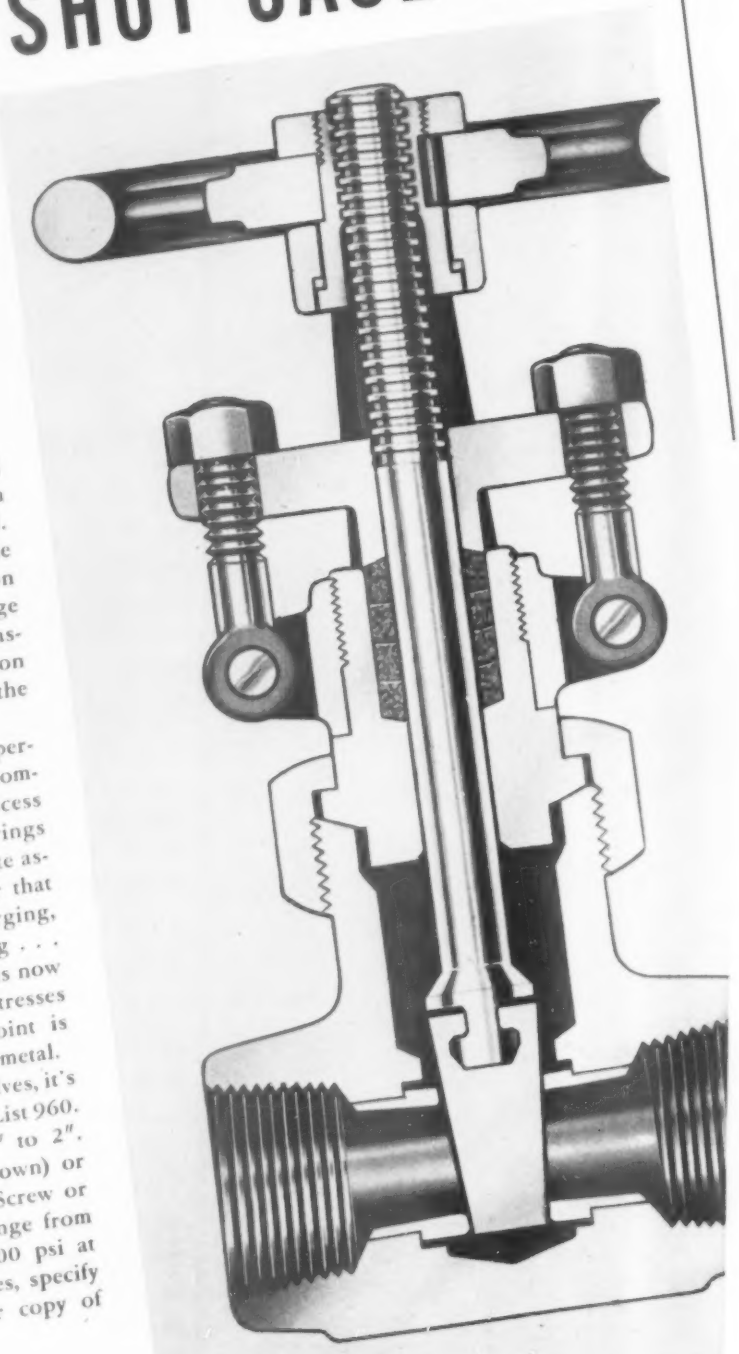
OPEN AND SHUT CASE FOR CHAPMAN LIST 960

Small Forged Steel Gate Valves

Chapman List 960 is used for more different jobs than any other valve of its kind. And no wonder: its simple and rugged construction means reliability over its wide range . . . super-hardened gate and seats assure tight closure, smooth operation and low maintenance under the toughest conditions.

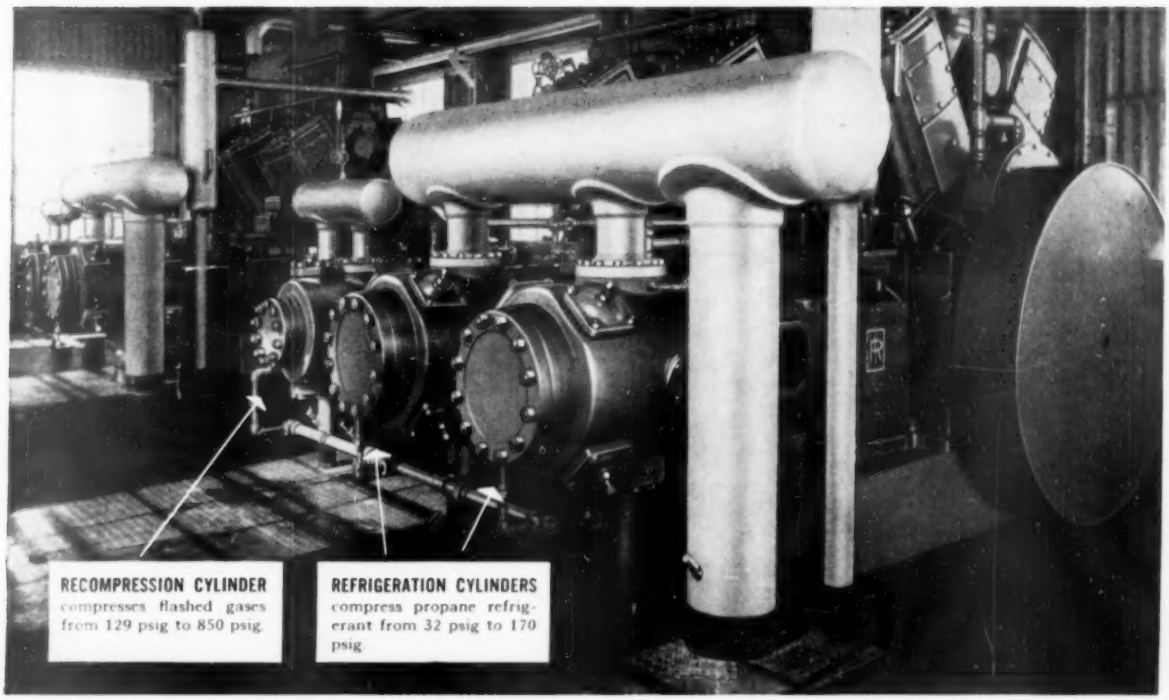
Here's why: gate faces are super-hardened to 800 Brinell by Malcomizing, Chapman's exclusive process . . . hardened stainless steel seat rings are replaceable . . . stem-and-gate assembly has a tapered shoulder that seats snug in the bonnet forging, permits full-pressure repacking . . . the stem-and-gate connection is now 50% stronger where high stresses can develop . . . bonnet joint is gasketed or ground metal-to-metal.

For big savings on small valves, it's a winning case for Chapman List 960. Available in sizes from $\frac{1}{4}$" to 2". Rising stem, with yoke (shown) or inside screw, rising stem. Screw or welding ends. Pressure range from 380 psi at 1000°F to 2000 psi at 100°F. For higher pressures, specify List 990. Write for your copy of Catalog 10 now.



The **CHAPMAN VALVE**
MANUFACTURING COMPANY
Indian Orchard, Mass.

Unique Gasoline Plant designed for MINIMUM EXTRACTION


RECOMPRESSION CYLINDER
compresses flashed gases from 129 psig to 850 psig.
REFRIGERATION CYLINDERS
compress propane refrigerant from 32 psig to 170 psig.

I-R SVG Compressors do double-duty at Northern Natural Gas Company's Gas Refrigeration Plant

THE primary purpose of Northern Natural's gas refrigeration plant at Holcomb, Kansas, is to extract only enough gasoline from the natural gas to prevent condensation in the transmission line. Pentane content is too low to justify the cost of a conventional absorption and distillation system. And heating value must be kept as high as possible.

These problems were effectively solved by refrigerating the gas to pipe-line temperatures, removing the condensate, and returning the flashed gas, under pressure, to the distribution line. While producing about 20,000 gallons of gasoline per day, this plant maintains maximum heating value of the gas and prevents loss of pipe-line efficiency due to hydrocarbon condensate.

Power for both refrigeration and recompression is provided by two Ingersoll-Rand 6SVG gas-engine-driven compressors. Two cylinders on each unit compress propane for refrigeration. The third cylinder recompresses the high btu vapors from the flash tanks for mixing with the outgoing gas.

This is just one example of the many instances where Ingersoll-Rand gas engine compressors have helped to solve a difficult problem simply and economically. Perhaps your process could benefit also. Why not let your I-R representative help you in planning and selecting the equipment for your new or remodeled plant.

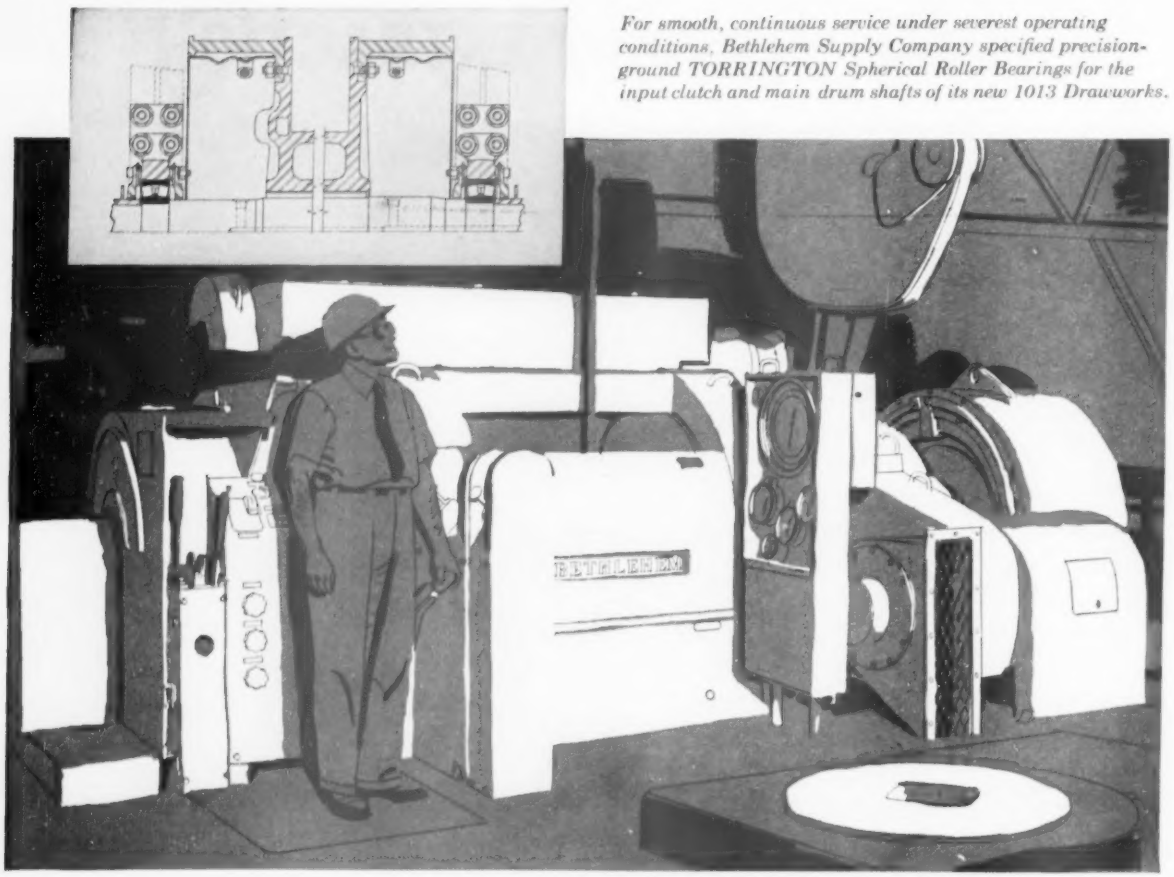
Ingersoll-Rand

6-44 11 Broadway, New York 4, N. Y.

COMPRESSORS • TURBO BLOWERS • CENTRIFUGAL PUMPS
VACUUM EQUIPMENT • ROCK DRILLS • AIR TOOLS

THE COMPLETE LINE OF INGERSOLL-RAND GAS-ENGINE COMPRESSORS . . . the JVG in 110,165 and 220-hp sizes; the SVG in 330,440 and 550-hp sizes; the KVG in 660, 880, 1100 and 1320-hp sizes; the Turbocharged 2000-hp KVS.

TORRINGTON BEARINGS AT WORK



For smooth, continuous service under severest operating conditions, Bethlehem Supply Company specified precision-ground TORRINGTON Spherical Roller Bearings for the input clutch and main drum shafts of its new 1013 Drawworks.

Cutting costs in modern drawworks!

More and more builders of today's newest, most powerful drawworks specify TORRINGTON Spherical Roller Bearings for their input, cathead and main-drum shafts.

TORRINGTON Spherical Roller Bearings are precision ground to high geometrical conformity from top-quality, carefully heat-treated alloy steels. They have fully machined, cast-bronze land-riding cages—*one for each path of rollers.* And they're self-aligning.

They cut friction to a minimum . . . carry heavier loads . . . have high radial stability . . . and compensate for shaft deflection . . . all for *faster, deeper* drilling at lower operating and maintenance costs.

They're available from stock with either straight or tapered bore, for shaft or adapter mounting. Specify TORRINGTON Spherical Roller Bearings for your own drawworks and other heavy-duty equipment.

THE TORRINGTON COMPANY
South Bend 21, Ind. Torrington, Conn.

TORRINGTON SPHERICAL ROLLER BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller • Needle • Ball • Needle Rollers

FASTER

MORE EFFECTIVE... MORE DEPENDABLE

FIRE-STOPPING POWER

MODEL 20-B

ANSUL
Chemical Company
FIRE EQUIPMENT DIVISION • MARINETTE, WISCONSIN

ANSUL

FIRE EXTINGUISHING EQUIPMENT

FASTER . . . A short, quick downward motion of the puncture lever pressurizes the extinguisher and it is ready for instant use.

MORE EFFECTIVE . . . Even the inexperienced operator gets near-expert results because of the ease of operation and handling. In addition ANSUL *"PLUS-FIFTY"* Dry Chemical has greater fire-killing power.

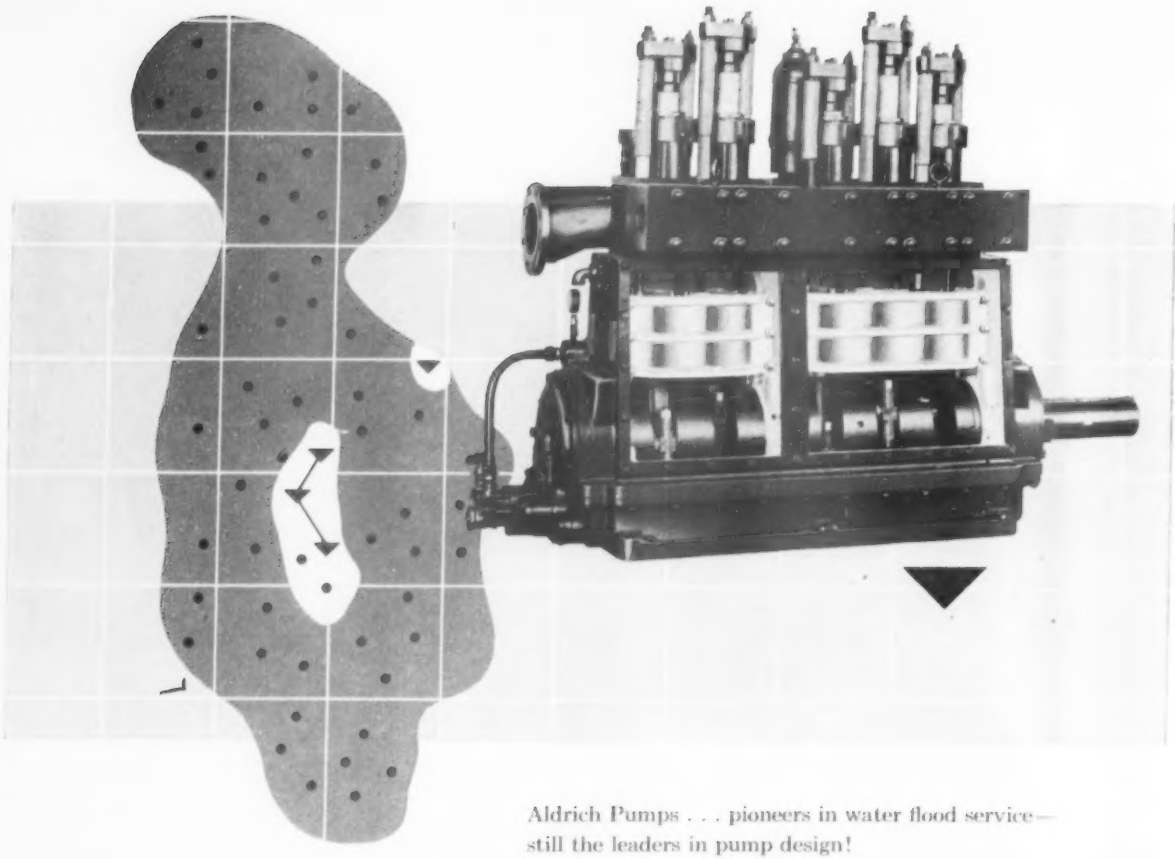
MORE DEPENDABLE . . . Exclusive ANSUL-ENGINEERED design features include water-tight and corrosion-resistant construction, easy, on-the-spot recharge without special tools and other exclusive Ansul developments which insure greater dependability.

FIRE-STOPPING POWER . . . ANSUL FIRE EXTINGUISHERS have the highest ratings for fire-stopping power ever awarded any type of class B and C fire extinguishing equipment.

Send for File No. B-215. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES

MANUFACTURERS OF
DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT, REFRIGERATION PRODUCTS, INDUSTRIAL AND FINE CHEMICALS AND LIQUEFIED GASES



Get peak water flooding efficiency with ALDRICH field-proven Direct Flow pumps

Aldrich Pumps . . . pioneers in water flood service—still the leaders in pump design!

- *high speed*—greater volume from more compact pumps.
- *low maintenance costs*—KOSMOS Porcelain Plungers and completely sectionalized fluid-ends reduce maintenance, material costs and down time.
- *complete range of sizes*—3″ Triplex, 5″ and 6″ Triplex and Multiplex units permit optimum combinations of pumps with maximum interchangeability of parts.
- *for corrosive service*—fluid-ends available in stainless steel or aluminum bronze.

the ALDRICH *pump company*

. . . Originators of the Direct Flow Pump

9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

Representatives: Bushnell Controls & Equipment Co., Inc., 5137 West Jefferson Blvd., Los Angeles 16, Calif. • Cross Pump & Equipment Co., P.O. Box 889, Charleston 23, W. Va. • Lloyd T. Gibbs Co., 1021 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Bolivar, N. Y. • Walter Norris Engineering Co., Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Ill. • Power Specialty Co., P.O. Box 6365, 2000 Kipling Street, Houston 6, Texas; The Suburban Bldg., Room 204, 5526 Dyer Street, Dallas 6, Texas • B. G. Harmon Service & Equipment Co., P.O. Box 309 (Farm Bureau Bldg.), Carmi, Ill. • Stearns-Roger Manufacturing Co., 1720 California Street, Denver 2, Colo. • Export: Petroleum Machinery Corporation, 30 Rockefeller Plaza, New York 20, N. Y.

Direct Flow Spare Parts Stock—at Carmi, Ill., Houston, Los Angeles, Odessa, and Tulsa

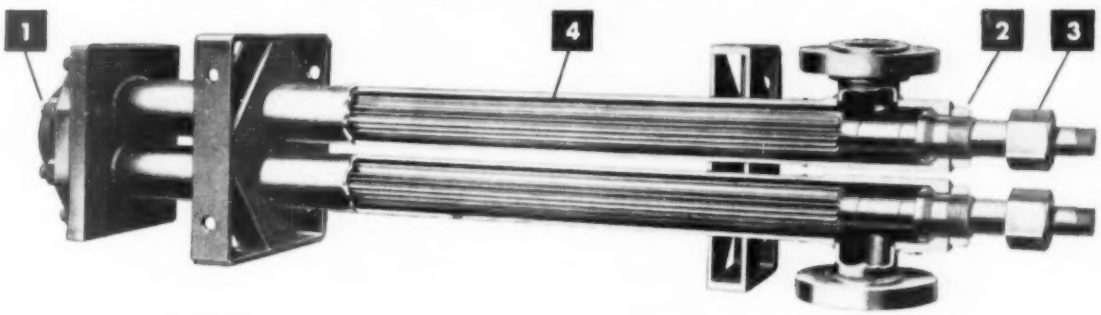
Positive Identification

Just as a person's fingerprints offer positive individual identification, so the design features of G-R Twin G-Fin Sections distinguish them from all other types of heat exchangers. They are positively G-R.

Simplest Head Closure

Easy Maintenance—Fewer Parts

This design provides greater ease of installation, as has been proved in the service of more than 70,000 G-R Twin G-Fin Sections on a greater variety of condensing, cooling, heating and heat exchange services than any other design on the market.



To Remove Element—

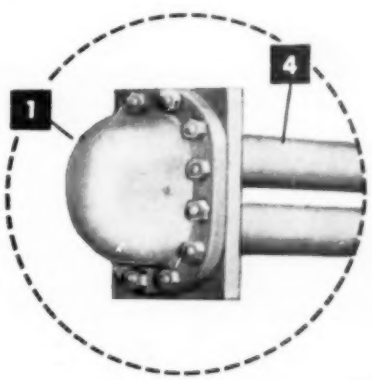
Take off shell cover (1)
Loosen and remove cone plug lock nut (2)
Loosen and remove union nut (3)
Remove element (4)

To Replace Element—

Insert element (4)
Replace and tighten cone plug lock nut (2)
Replace and tighten union nut (3)
Replace shell cover (1)

Domed Shell Cover

This type of shell cover is particularly rugged, yet weighs only 17 pounds for the small sections and 43 pounds for the standard high capacity sections.



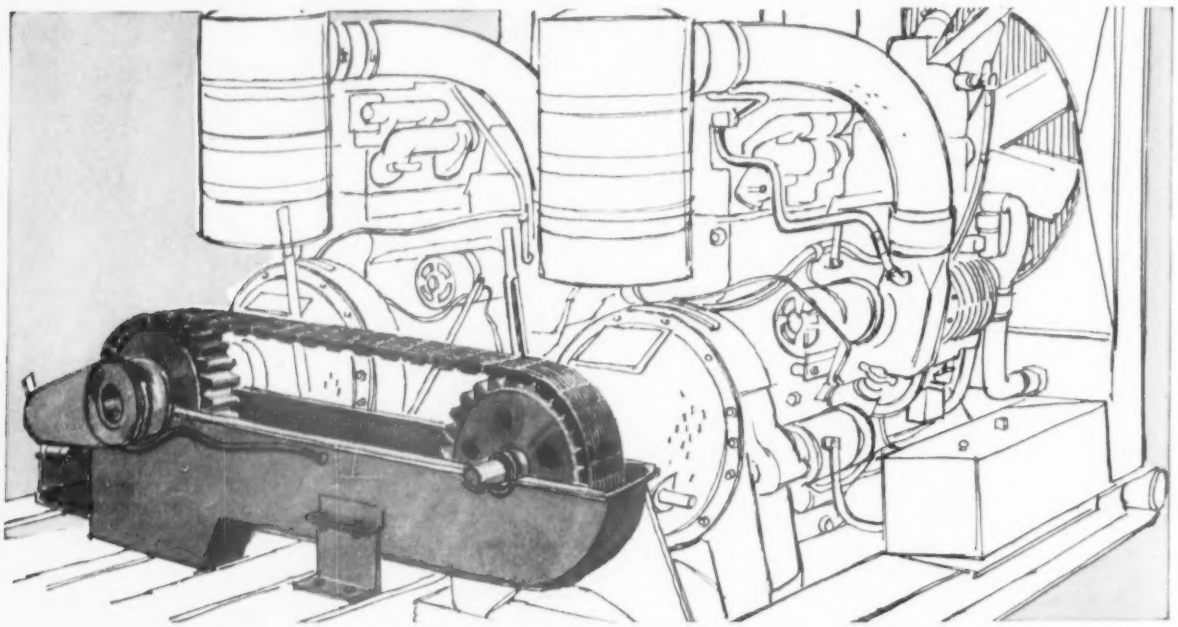
THE GRISCOM-RUSSELL CO.
MASSILLON, OHIO

G-R Twin G-Fin Section

HEAT TRANSFER APPARATUS

GR-224

Morse HY-VO DRIVE for a new age in power transmission!



How compounding with HY-VO could save you as much as $4,560

Now, gain new advantages in buying and compounding smaller, higher speed engines with Morse Hy-Vo Drive.

You make major cost savings.

The total cost of two high-speed engines and the Hy-Vo Drives with which they are compounded will usually be considerably less than a single large engine of equivalent horsepower. A brief look at some figures will show how this works . . .

For example, if you needed 250 continuous horsepower at 1200 rpm., you could: 1) Buy a manufacturer's 250 hp., 1200 rpm. engine, which lists for $13,380; 2) buy the 250 hp., 1800 rpm. engine for $11,930 (using Hy-Vo as a connection and reduction drive, also eliminates the costly flexible coupling normally required in choice No. 1); 3) or, use two 130 hp., 1800 rpm. engines, listing for a total of $8,820, and use Hy-Vo as your compounding drive.

With the 250 hp., 1800 rpm. engine, you save $1,450, more than enough to pay for your Hy-Vo Drive. Compounding two 130 hp., 1800 rpm. engines, you save $4,560 over base list cost of the 250 hp., 1200 rpm. engine.

From this saving you could pay for your Hy-Vo Drive and bank several thousand dollars. In most cases, too, Hy-Vo will be so narrow it will eliminate costs of outboard bearings and mountings, with the bonus that single-engine operation is possible under reduced power requirement.

Other power transmission methods generally have either inherent restrictions on rotative speeds and velocities that limit 200 hp. or larger engines to 1200 rpm., or are too costly. Hy-Vo has far greater upper limits, with relatively lower cost.

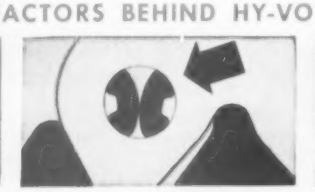
Because of exceptional rotative speeds and velocities, Hy-Vo brings you comparable savings in electric motors, too. Write us for details on compounding with Morse Hy-Vo Drive.

MORSE CHAIN COMPANY

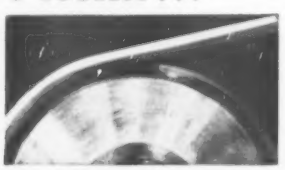
7601 Central Ave. • Detroit 10, Michigan

SOME DESIGN FACTORS BEHIND HY-VO'S SUCCESS . . .

Hy-Vo's many design and manufacturing refinements result in a drive with unusual power transmitting capacity. Note involute tooth design of Hy-Vo Sprockets . . .



. . . and the new, Hy-Vo Compensating Rolling Joint, which always shifts the pitch line automatically as the Hy-Vo Chain engages the involute teeth of the sprocket.



Chain follows a path truly tangent to sprocket pitch circle, virtually eliminating chordal action. A new, balanced link design greatly improves stress distribution.

MORSE

MECHANICAL POWER TRANSMISSION PRODUCTS

They Say—

Tulsa Oil Show Praised

"I cannot pass the opportunity to mention the Tulsa show. I feel it is the finest symbol of progress and results in untold benefit to the oil industry.

"The first portable pulling unit with a collapsible derrick was brought to California in 1940 for use at our Bolsa lease as a direct result of our search for something of the kind at the Tulsa show of that year.

"Recognizing great expense involved, both in dollars and manpower, I can only express the hope that you will continue to hold this great exposition as often as possible, and I can assure you our company will make every effort to see that every possible producing and drilling executive and foreman will see it for the ideas that come out of it."

Russell H. Green, vice president, Signal Oil & Gas Co., Los Angeles, in an address before the Petroleum Suppliers Association.

Restraint Versus Unrestraint

"The major current difficulties of the American oil industry—overproduction and stagnated price levels—grow out of the fact that in addition to losing the greater part of a once-large export market, it is denied the opportunity to supply much of the increase in domestic consumption.

"While domestic demand went up 4.8 per cent in 1953, production within the United States increased only 3.3 per cent. At the same time the output of Iraq increased 48.1 per cent and that of Kuwait 15.4 per cent. Production in the free world outside of the United States was up 15.1 per cent.

"This competition of oil from the Middle East, where production is unrestrained, where dry holes are almost nonexistent and where operating costs are much lower than in the United States, was dramatized in late February of this year when a tanker unloaded 100,000 bbl. of Saudi Arabian oil in Houston, Tex. This delivery was made in a state which produces 40 per cent of our domestic output and where, at the time of the delivery, the industry was permitted only 15 days of allowable production during the month.

"The unfairness of this competitive situation and its inevitably serious adverse effect upon the domestic industry is further portrayed by the fact that only 40 wells in Saudi Arabia produce

Fyr-Fyter

DRY CHEMICAL EXTINGUISHERS

Reach for Fyr-Fyter Dry Chemical Extinguishers . . with absolute assurance of protection performance! They're engineered to PERFORM with "Sealed-In" power that's harnessed in perfected air-tight, water-tight sealing to provide fast, positive, fire-fighting action . . . *without fail!* The simple, squeeze-grip nozzle control releases a thrust of force that's SURE . . . expelling a long-range, heat-shielding, flame-smothering stream of free-flowing chemical powder. On contact, the flame-smothering powder puts out fires in gasoline, petroleum products, paint, varnish, lacquer, turpentine, alcohol . . . *all flammable liquids, gas, butane, propane, chemical and electrical fires!* Stainless steel tank and aluminum castings provide extra strength for more rugged use, and less weight for easier handling.

For assured protection performance . . . be SURE with an Underwriters' Approved Fyr-Fyter Dry Chemical Extinguisher!

WRITE ON YOUR LETTERHEAD FOR FULL DETAILS TODAY!

FF-5

The Fyr-Fyter (FIRE) (FIGHTER) Co.

221 CRANE STREET, DAYTON 1, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

BRANCH OFFICES: *New York, Boston, Philadelphia, Chicago, Atlanta, Dallas, San Francisco, Portland, Seattle*

A major oil refining company on the eastern seaboard is building a catalytic reforming plant with capacity of 17,600 barrels per day....

. . . and PETROCHEM-ISOFLOW Furnaces will charge this 17,600 bpd plant.

A major oil refining company on the Texas gulf coast is building a catalytic reforming plant with capacity of 21,000 barrels per day....

PETROCHEM-ISOFLOW Furnaces

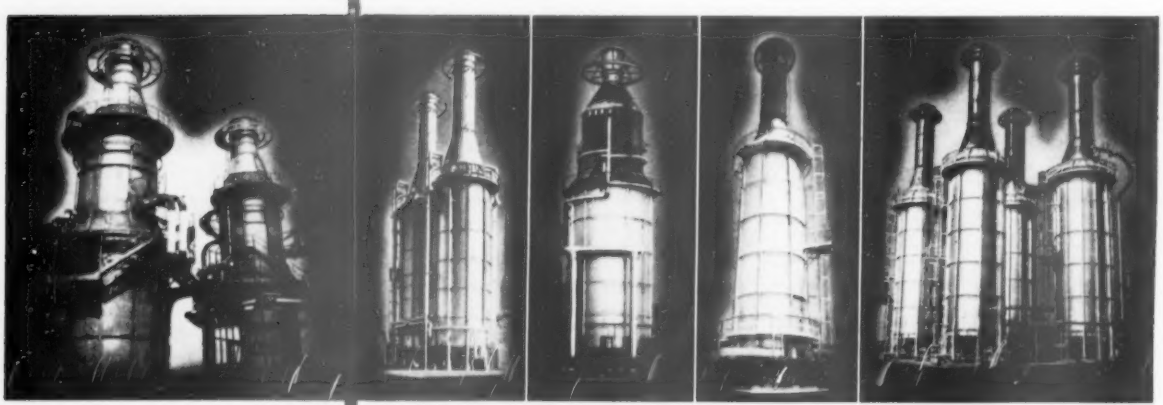
. . . and PETROCHEM-ISOFLOW Furnaces will charge this 21,000 bpd plant.

purchased for two of the largest cat reformers

Our first cat reformer heaters went into operation three years ago. Since then, we have sold catalytic reforming heaters for plants ranging from 1,000 barrels to 21,000 barrels per day. If you anticipate the installation of a catalytic reformer of any type, you will profit by investigating PETROCHEM-ISOFLOW heaters for this service.

More than 1150 Petrochem-Isoflow Furnaces are in operation throughout the world in the petroleum, chemical and allied industries . . . for all processes and for any duty, pressure, temperature and efficiency . . . and all

Petrochem-Isoflow Furnaces are most efficient by any comparison.



PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INC. • 122 East 42nd St., New York 17, N. Y.

Representatives: Bethlehem Supply, Tulsa and Houston • Flagg, Brackett & Durgin, Boston • D. D. Foster, Pittsburgh • Faville-Levally, Chicago • Lester Oberholtz, Los Angeles • Gordon D. Hardin, Louisville • Turbex Equipment Co., Harberth, Pa.

more oil than all of the 17,003 wells drilled in the State of Texas last year. The average daily production per well in Saudi Arabia is 6,257 bbl. as compared to less than 13 bbl. in this country. It costs no more to operate a well producing 6,000 bbl. daily than it does a 10-bbl. 'stripper'."

Walter S. Hallanan, president, Plymouth Oil Co., in the company's 1953 annual report.

Webster ('29) vs. Webster ('54)

Sir:

Pipeline—noun? (Prairie Pipeline Co., Humble Pipeline Co.) Shades of our ancestors!

Are our customs and laws to give way to whims of an egg head (egg-head, egghead) from Harvard?

Webster's New International Dictionary (1929) has the following: "pipe line" (2 words); "pipe-line, v.t."

H. H.

Fort Worth, Tex.

Editor's note: The reader is right. In 1929 it was "pipe line" and "pipe-line."

For Freer World Trade

"It seems to us that freer world trade would be of great benefit to the economies of all nations, including our own. Jersey believes that not only should our government pursue liberal and constructive policies in the general fields of foreign trade, taxation, and investment, but other governments, too, must work toward elimination of trade barriers.

"In our opinion, the most satisfactory balance between imports and domestic oil production can best be achieved through good business judgment by individual companies."

Eugene Holman, chairman, and M. J. Rathbone, president, Standard Oil Co. (New Jersey), in a letter to shareholders.

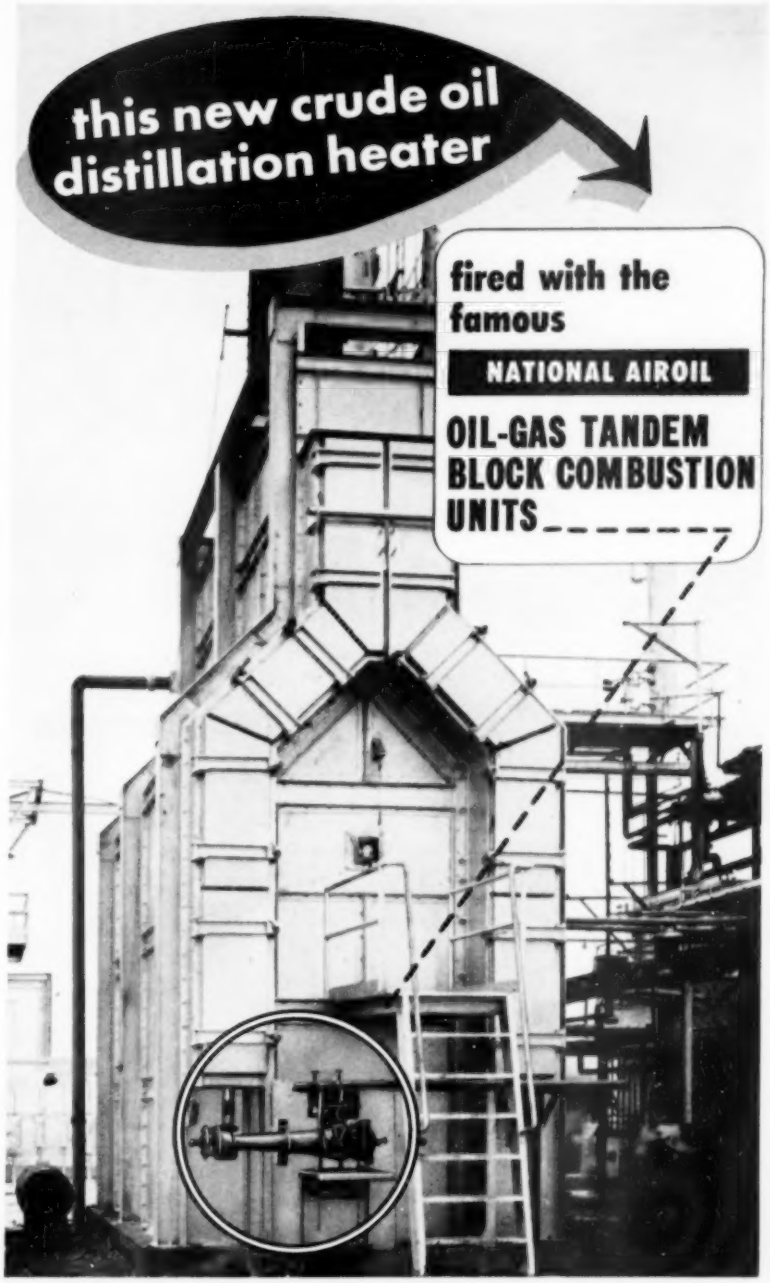
Contractor's Crying Towels

"The peace of mind of a contractor is . . . destroyed . . . by ever increasing costs.

"Using 1941 as a base year his labor costs have increased to 198 per cent, his equipment costs to 188 per cent, and his miscellaneous costs to 188 per cent, which add up to a total drilling cost of 192 per cent.

"The remarkable, or I should say regrettable thing, is that the footage drilling price has barely increased to 102 per cent. The only salvation has been a strict adherence to his single purpose in life of making hole deeper and faster which has resulted in an increase in the rate of penetration of 142 per cent.

"Albeit the receipt of sly gibes about



. . . MEANS MANY MORE HOURS ON STREAM WITHOUT SHUTDOWN

This heater (RJ Oil & Refining Co., Inc., Princeton, Indiana) is fired from each end with one of NATIONAL AIROIL's #2 combination oil and gas, patented, Tandem Block Combustion Units.

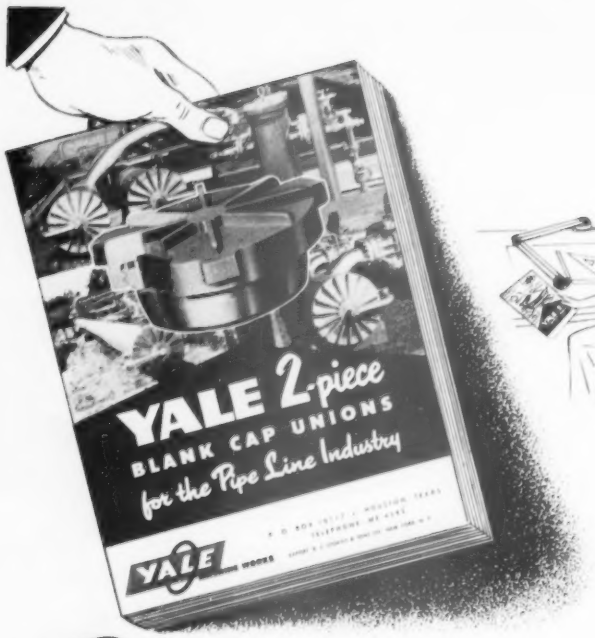
The Tandem Unit is always fired with NATIONAL AIROIL Combination Oil and Gas Burners . . . has a high turndown ratio with a steady flame . . . maintains required temperature using either fuel . . . radiates heat uniformly without tube impingement. With the Tandem Unit's clean flame, a cold furnace can be brought to full capacity in a shorter time.

You will realize more satisfaction from YOUR heaters when NATIONAL AIROIL Tandem Combustion Units are specified.

NATIONAL AIROIL BURNER CO., INC.

CHEMICAL-PETROLEUM DIVISION
1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.
Southwestern Division: 2512 South Boulevard, Huston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT



Preferred **BY ENGINEERING**

Engineers like to specify equipment that will do its job without fuss or bother . . . equipment that will *give service* and *stay in service* with a minimum of attention. In unions, they like a secure pressure seal, ease of handling and freedom from installation problems. Above all, they like a piece of equipment which, through its modern design, actually does a better job at lower cost.

These are the reasons so many pipe line engineers the world over are specifying "YALE UNIONS" in their specifications of new construction. Complete information on these preferred unions will be sent upon request.

YALE MACHINE WORKS

DISTRIBUTED BY:
YALE SALES COMPANY
P. O. BOX 10192 PHONE ME-6418 HOUSTON, TEXAS

ALMOST AS EASY AS OPENING A DOOR

driving around in Cadillacs and having swimming pools, and incidently I personally know of very few contractors possessing swimming pools—in fact I would say 90 per cent don't even know how to swim—the average net profit for Pacific Coast contractors, after income taxes, is 3.42 per cent.

"Think of it, 3.42 per cent in an extremely hazardous business! With this figure in mind it is easy to see why a crying towel is a necessary part of a contractor's wardrobe!"

Joseph K. Kellogg, secretary-treasurer, K. L. Kellogg & Sons, speaking at the Los Angeles meeting of the Petroleum Equipment Suppliers Association."

CALENDAR

APRIL

27 Distillation in Practice, second of an Experience in Industry series, Philadelphia - Wilmington section of the American Institute of Chemical Engineers and University of Pennsylvania, University Museum, Philadelphia.

MAY

2- 4 Independent Petroleum Association of America, midyear meeting, Cosmopolitan Hotel, Denver.

3- 5 American Geophysical Union, thirty-fifth annual meeting, National Academy of Sciences, Washington, D. C

3- 5 Air Pollution Control Association, annual meeting, Patten Hotel, Chattanooga, Tenn.

4-7 American Welding Society, national spring meeting, Hotel Statler, Buffalo, N. Y.

6- 7 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

9-12 Liquefied Petroleum Gas Association, annual convention and trade show, Conrad Hilton Hotel, Chicago.

10-12 Ninth annual Purdue Industrial Waste conference, Purdue Memorial Union, Lafayette, Ind.

10-12 American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Warwick Hotel, Philadelphia.

10-13 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

12-13 Pacific Coast Gas Association, gas supply and transmission conference, Mark Hopkins Hotel, San Francisco.

14-15 Interstate Oil Compact Commission, General Oglethorpe Hotel, Savannah, Ga.

16-19 American Institute of Chemical Engineers, Springfield, Mass.

17-19 American Petroleum Institute, Division of Marketing, midyear meeting, Cosmopolitan Hotel, Denver.

20-21 Kentucky Oil and Gas Association annual meeting, Lafayette Hotel, Lexington, Ky.

24-26 American Gas Association, production and chemical conference, William Penn Hotel, Pittsburgh.

27-28 Natural Gas and Petroleum Association of Canada, Prince Albert Hotel, Windsor, Ont., Canada.

31-June 5 American Petroleum Institute, Divi

sion of Production, midyear committee conference, St. Francis Hotel, San Francisco.

JUNE

2-4 Southern Gas Association, short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

3-4 Pennsylvania Grade Crude Oil Association, thirty-first annual meeting, Hotel William Penn, Pittsburgh.

6-11 Society of Automotive Engineers, summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

13-18 American Society for Testing Materials, annual meeting and exhibit, Sherman and Morrison Hotels, Chicago.

14-17 Twenty-sixth annual confrence and exhibit, Oil and Gas Division of the American Society of Mechanical Engineers, Hotel Muehlebach, Kansas City.

17-19 American Petroleum Institute, Division of Production, eastern district meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

17-19 National Oil Scouts and Landmen's Association, annual meeting, New Orleans.

20-24 Canadian Gas Association, Banff Springs Hotel, Banff, Alta., Canada.

JUNE 20-JULY 4 Seventh annual Conferences on Personnel Administration and Managerial Development, Industrial Relations Section of the California Institute of Technology, California Institute of Technology, Pasadena, Calif.

21-25 Gordon Research conferences, conference on petroleum, Colby Junior College, New London, N. H.

24-25 Western Petroleum Refiners Association, regional meeting, Leonard refineries auditorium, Alma, Mich.

25-26 Southern Gas Association, transmission management conference, Hotel Adolphus, Dallas.

27 July 1 Petroleum Equipment Suppliers Association, nineteenth annual meeting, Manoir Richelieu, Murray Bay, Que., Canada.

JULY

23 Southern Gas Association, communications conference, Rice Hotel, Houston.

24 Southern Gas Association, dispatchers' conference, Rice Hotel, Houston.

AUGUST

16-18 Society of Automotive Engineers, West Coast annual meeting, Statler Hotel, Los Angeles.

20 Southern Gas Association, natural-gas processing conference, Herring Hotel, Amarillo, Tex.

21 Southern Gas Association, pipe-line operations conference, Herring Hotel, Amarillo, Tex.

23-25 Fourteenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-28 (tentative) Intermountain Association of Petroleum Geologists, fifth annual field conference, beginning at Price, Utah.

SEPTEMBER

7-9 Association of Desk and Derrick Clubs of North America, annual convention, Banff Springs Hotel, Banff, Alta.

8-10 Pacific Coast Gas Association, sixty-first annual meeting, Vancouver Hotel, Vancouver, B. C.

designed and built . . .

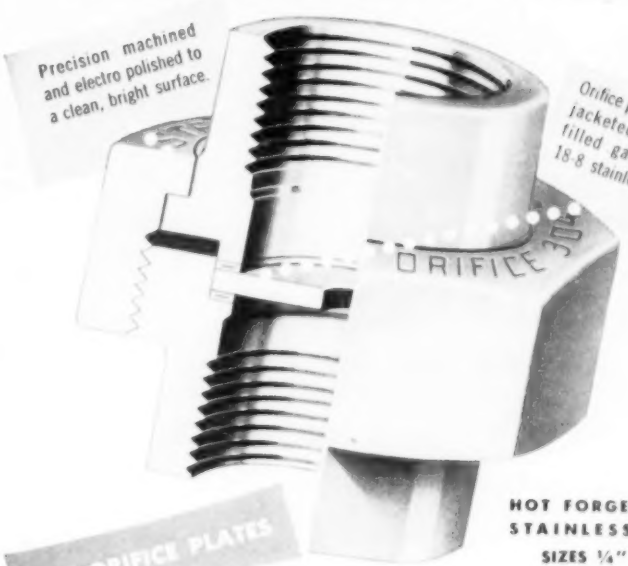
for top performance on all metering, measuring and flow control services.

STAINLESS STEEL

ORIFICE 304

STAINLESS STEEL

ORIFICE 304 DUAL


Precision machined and electro polished to a clean, bright surface.
Orifice plate and two jacketed asbestos filled gaskets are 18-8 stainless steel.
ORIFICE 304
THE ORIFICE PLATES

HOT FORGED FROM STAINLESS STEEL SIZES ¼" TO 2"

and gaskets are set in a groove of solid stainless steel to facilitate tightening and safeguard against blowing of gaskets. Plates drilled to specification or perforated for use as strainer union. Solid plates can be used for blanking off.

ORIFICE 304 unions are all stainless steel (Type 304) with recommended working pressures of 3000 pounds at 250° F. on services where stainless steel is required. Type 316 and 347 stainless steel ORIFICE unions are also available.

ORIFICE 304 DUAL is our trade name for unions with stainless steel ends, gaskets and plates and carbon steel (Udylited) nuts. Available with Type 304, 316 or 347 stainless steel and recommended for service where atmospheric pressure is not a problem.

C. M. & CO. ORIFICE forged steel unions have, for years, been recognized as leaders among all orifice unions for outstanding dependable service.

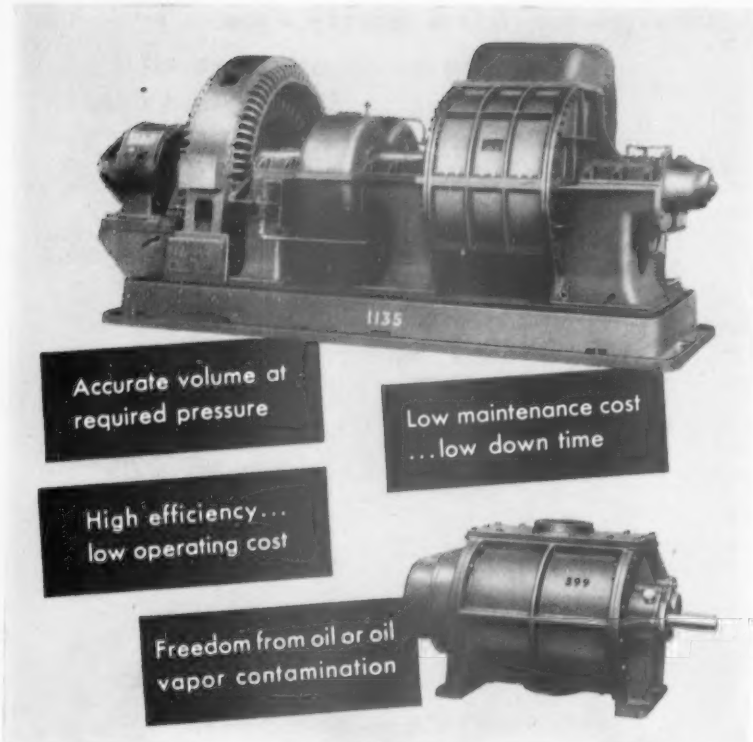
WRITE DEPARTMENT "C" FOR ILLUSTRATED LITERATURE

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS


1135
Accurate volume at required pressure
Low maintenance cost ...low down time
High efficiency... low operating cost
399
Freedom from oil or oil vapor contamination

LOOK FOR THE "BIG 4"

WHEN YOU BUY BLOWERS

Successful over-all performance of blowers calls for continuous, long-time ability to meet these basic requirements. In any specific case, one may be more important than another. But, when you select Roots-Connersville equipment, you sacrifice none of these four essentials. That is true, whether your requirements are for a whisper of air or for a tornado. You'll find the R-C range of capacities so extensive that you can very closely match your needs, with resulting economies in both first cost and operating cost. Further, you have the choice of either Rotary Positive or Centrifugal Blowers, from the exclusive R-C *dual-ability* line.

The ability to deliver blowers with these fundamental values comes from our century of specializing in problems of handling gas and air. The proof of this ability is readily found in our list of long-time customers who have gained complete satisfaction by entrusting their blower problems to Roots-Connersville. Ask us about your present or future needs in equipment to handle gas or air.

ROOTS-CONNERSVILLE BLOWER

Reg. U.S. Pat. Off.

A DIVISION OF DRESSER INDUSTRIES, INC.
454 Oak Ave. • Connersville, Indiana

Specialists in handling gas and air

9-11	Interstate Oil Compact Commission, Omaha, Neb.
12-16	American Institute of Chemical Engineers, Colorado Hotel, Glenwood Springs, Colo.
13-14	Independent Natural Gas Association of America, annual meeting, Roosevelt Hotel, New Orleans.
15-17	National Petroleum Association, fifty-second annual meeting, Traymore Hotel, Atlantic City, N. J.
16-17	Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.
23-24	Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.
25	Southern Gas Association, compressor-station conference, Captain Shreve Hotel, Shreveport, La.
27-29	Electrical Conference for Petroleum Industry, American Institute of Electrical Engineers, Mayo Hotel, Tulsa.
27-30	Ninth Annual Petroleum Mechanical Engineering Conference, petroleum division of the American Society of Mechanical Engineers, Statler Hotel, Los Angeles.

OCTOBER

2	Southern Gas Association, right-of-way conference, Peabody Hotel, Memphis, Tenn.
4-6	Texas Mid-Continent Oil and Gas Association, annual meeting, Plaza Hotel, San Antonio, Tex.
4-6	Petroleum Electric Power Association, twenty-sixth anniversary meeting, Jung Hotel, New Orleans.
7- 8	California Natural Gasoline Association, twenty-ninth annual fall meeting, Ambassador Hotel, Los Angeles.
7-8	American Institute of Mining and Mettallurgical Engineers, Pacific Petroleum chapter, fall meeting, Biltmore Hotel, Los Angeles.
9	Southern Gas Association, field production of natural gas roundtable, Rice Hotel, Houston.
11-13	American Gas Association, annual convention, Atlantic City, N. J.
11-13	American Association of Oilwell Drilling Contractors, annual meeting, Biltmore Hotel, Los Angeles.
12-15	Eighth National Chemical Exposition, Chicago Coliseum, Chicago.
14-17	Permian Basin Oil Show, Odessa, Tex.
16	Southern Gas Association, transmission management conference, Rice Hotel, Houston.
17-20	American Institute of Mining and Metallurgical Engineers, petroleum division, fall meeting, Plaza Hotel, San Antonio.
24-26	Independent Petroleum Association of America, annual membership meeting, Mayo Hotel, Tulsa.
26-27	Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.

NOVEMBER

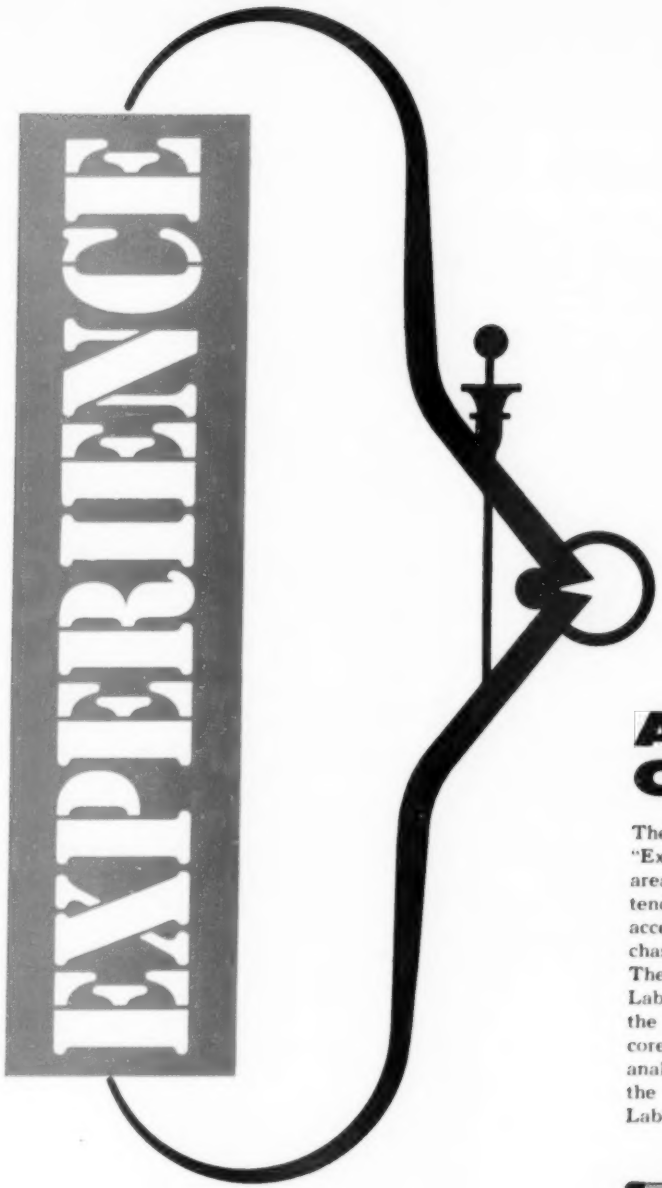
4-5	Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.
8-11	American Petroleum Institute, thirty-fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

28-Dec.

3	American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4	Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago.



A MEASURE OF QUALITY

The name "Core Lab" is synonymous with "Experience." Eighteen years' work in all active areas, under all types of formation productive tendencies, contributes greatly to the broad acceptance of Core Lab data by operators, purchasers of reserves, and state regulatory boards. The factual and interpretive qualities of Core Lab's Core Analysis Reports are measured by the experience of performing 25,000 individual core analyses and 700 different reservoir fluid analyses. Sooner or later you'll be faced with the question, "pay-out or play out"? Let Core Lab's experience establish your answer *now*.

DALLAS, HOUSTON, CORPUS CHRISTI, MIDLAND, ABILENE, SAN ANTONIO, TYLER, TULSA, FT. WORTH, WICHITA FALLS, OKLAHOMA CITY, ARDMORE, PAMPA, ARKANSAS CITY, GREAT BEND, NEW ORLEANS, SHREVEPORT, HATTIESBURG, JACKSON, LAFAYETTE, DENVER, BAKERSFIELD, WORLAND, STERLING, BILLINGS, CASPER, EL DORADO, LUBBOCK, FARMINGTON, LOVINGTON, CALGARY, EDMONTON, REGINA, CANADA; VENEZUELA, S. A.

Put this Time-Saver Tag on your next Radioactivity Well Logging Job

Lane-Wells Dualized Logging Service cuts your down-time in half—and still gives you the same sharp, fully detailed curves which have been proved accurate and reliable in the more than 50,000 wells logged in the past 12 years by Lane-Wells Radioactivity Well Logging Service.

Write for further information.

Tomorrow's Tools—Today!

LANE-WELLS General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

AR-706

THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

●

P. C. Lauinger, President; S. H. Rourke, Executive Vice President; Mitchell Tucker, Vice President and Advertising Manager; Hanson B. Pigman, Circulation Manager; Donald W. Wilson, Manager, Industry Census Department; J. Parker Holland, Production Manager.

EDITORIAL STAFF

TULSA OFFICE, 211 South Cheyenne Avenue, Phone 3-6291: Kenneth B. Barnes, **Editor;** Henry D. Ralph, **Chief Editorial Writer;** Ted A. Armstrong, **News Editor;** Gerald L. Farrar, **Engineering Editor;** Dr. Frank J. Gardner, **Exploration Editor;** Paul Reed, **Pipeline Editor;** John C. Reidel, **Petrochemical Editor;** C. O. Willson, **Consulting Editor;** W. L. Nelson, **Technical Editor;** Lynn M. Nichols, **Presentation Editor;** John C. Casper, **Economics Editor;** Neil Williams, **Associate Editor;** Edwin McGhee, **Drilling-Production Editor;** Norman S. Morrisey, **Drilling-Development Editor;** Paul Swain, **Assistant News Editor;** Robert G. Deering, **Assistant Pipeline Editor;** R. B. Tuttle, **Equipment Editor.**

Tulsa District Editors: Charles L. Burch, Carl Hoot, John C. McCaslin, John M. McGivern, and Carl J. Lawrence.

Tulsa Editorial Assistants: Helen Brown, Martha Allbright, Alice Burt, and Aileen Cantrell.

NEW YORK OFFICE: 500 Fifth Avenue, Phone LOngacre 4-1750: George H. Weber, **Refining Editor,** and Dahl M. Duff, **International Editor.**

HOUSTON OFFICE, 802 Sterling Building, Phone CHarter 4626: F. Lawrence Resen and William P. Sterne, **District Editors.**

DALLAS OFFICE, 1238 Mercantile Bank Building: Robert J. Enright, **District Editor.**

LOS ANGELES OFFICE, 650 South Grand Avenue, Phone VAndyke 0722: D. H. Stormont, **District Editor.**

WASHINGTON OFFICE, 621 Albee Building, Phone DI 7-1710: Bertram F. Linz, **District Editor.**

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., and Mount Pleasant, Mich.

Advertising Offices: TULSA, John D. Reilly, Mid-Continent Manager and George O. Ruppert, Representative, 211 South Cheyenne, Phone 3-6291; NEW YORK: Charles A. Wardley, Eastern Manager, and Robert N. Caird, Jr., Representative, 500 Fifth Avenue, Phone LOngacre, 4-1750; CHICAGO: E. S. Klappenbach, Midwestern Manager, and David T. Kenney, Representative, 105 West Madison Street, Phone Central 6-2537; PITTSBURGH: Alfred M. Jones, Manager, 429 Fourth Avenue, Phone Atlantic, 1-4835; HOUSTON: John M. Spears, Gulf Coast Manager, Sterling Bldg., Phone CHarter 4626; LOS ANGELES: Donald O. Hanson, Manager, 650 South Grand Avenue, Phone VAndike 0722; ENGLAND: Harry Becker, European Representative, 111 Thorley Lane, Timperley, Cheshire, Phone Ringway 4702.

●

Subscription rate to the petroleum industry, United States and foreign, 1 year, $4.00. Single copies, 50 cents. Back copies when over a year old, one dollar. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1954 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY Speaking

Our Debt to Drink

COMES now our annual Field Processing issue, and our engineering writers have assembled what to the uninitiated would seem to be indubitably the last word on the subject of bubble towers and fractionating columns.

Last word it may be, but to this department is left the task of bringing you the first word on petroleum distillation. So far as our researches have revealed, the first word was that of Dioscorides, the ancient Greek pharmacist, who thus described the preparation of distillates from tar:

"Of Pitch is made oleum picinum, the watry matter of it which swims on ye top as whey doth of milke being separated. This is taken away in ye seething of the Pitch by laying cleen wool ouer it which when it is made moyst by the steam thereof ascending upon it is squeezed out into a vessel and this is donne as long as the Pitch is seething."

Pretty crude fractionating, but it was all there was until the medieval alchemists invented the worm still in their search for the Philosopher's Stone and the Elixir of Life. Then some unknown genius discovered that he could run wine through such apparatus and produce a spiritus frumenti with a much upgraded octane number.

Now that some worth-while use had been found for it, the art of distillation began to make real advances. Wheat, corn, potatoes, and other things formerly of no value except for eating were subjected to distillation and yielded liquid cheer of varying degrees of potency and potability. But instrumentation control was lacking and a lot of fusel oil and other annoying contaminants came over with the joy juice.

So the Dutch began distilling their schnapps with juniper berries to mask the taste and thus invented Holland gin which, we have been told, is still consumed in some quarters. But the fastidious French couldn't stomach this lowlands firewater, so they forthwith invented the fractionating tower by which they could control the specs of their decantations and thus gave to the waiting world something called cognac, whatever that may be.

So, you see, if it hadn't been for Demon Rum the fractionating tower might never have been invented. As it was, petroleum refiners took over where the moonshiners left off. To find out what they've done with it since, turn to page 136 and keep on reading.

Advertising Additives

THE additive race as a means of selling gasoline and motor oil is getting hotter and hotter all the time. Without casting any aspersions on the value of the scientific research behind all the new products, we venture the suspicion that in some companies the advertising departments are getting a bit ahead of the researchers in developing additives.

We have previously mentioned one oil company which condensed its trademark into a set of initials to indicate that something new had been added to its gasoline. Now we hear of another company which is cashing in on the H-bomb publicity by stressing that its gasoline contains hydrogen. This may be a good gimmick for those who know nothing about hydrogen except that it recently knocked an island clear out of the Pacific Ocean, but we wonder how it will strike motorists who happen to recall that all gasolines always have been compounds of carbon and hydrogen.

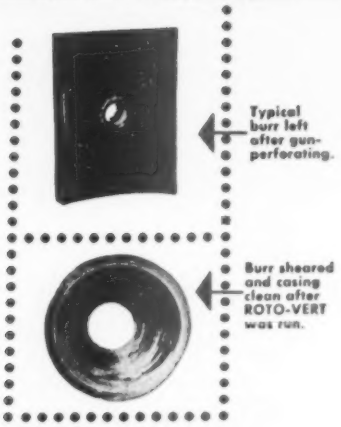
And another company's filling-station attendants are now handing motorists an oil can containing a battery-powered phonograph which gives a sales spiel on that brand of oil while the attendant goes about servicing the car.

Who says the oil industry isn't competitive?

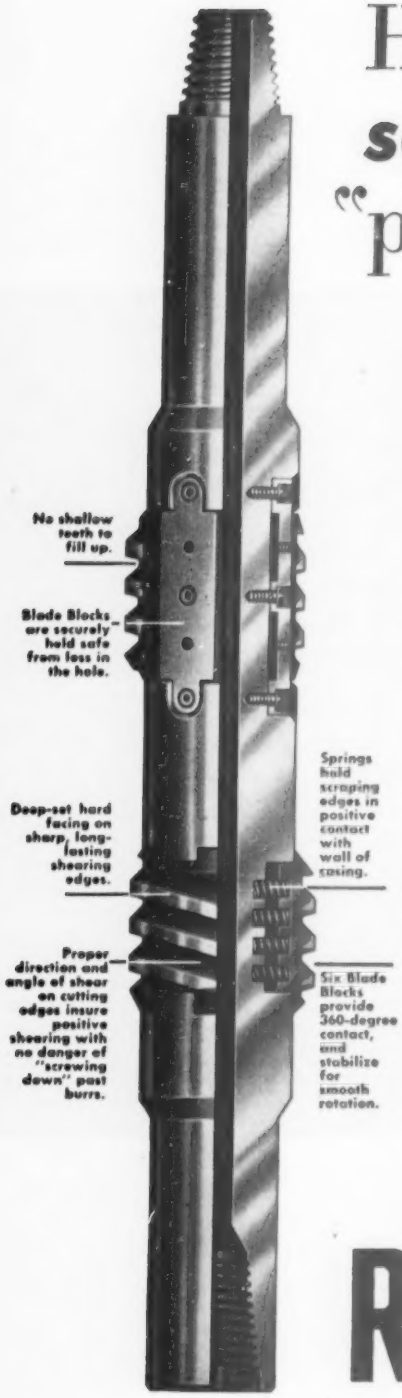
Next Week

NEXT week you'll see some changes in the arrangement of material in our favorite oil publication. Nothing will be dropped but certain features will be found in new places. We'll explain all about it in this space next week.

—Henry D. Ralph.



Here's why
SCRAPING YOUR CASING
"pays off"


No shallow teeth to fill up.
Blade Blocks are securely held safe from loss in the hole.
Springs hold scraping edges in positive contact with wall of casing.
Deep-set hard facing on sharp, long-lasting shearing edges.
Proper direction and angle of shear on cutting edges insure positive shearing with no danger of "screwing down" past burrs.
Six Blade Blocks provide 360-degree contact, and stabilize for smooth rotation.

Unless the inside of your casing—the vital "working surface"—is clean and smooth, there is always a possibility of trouble in future operations. Burrs from gun-shot perforations, hardened cement or mud, and even mill scale are all dangerous when the time comes to run testers or swabs, or to set retainers or packers of any description.

The Baker Model "C" ROTO-VERT Casing Scraper removes undesirable obstructions from the inside of the casing, leaving it clean and smooth. Burrs or imbedded bullets are sheared away; cement, mud and scale are scraped away, so that any down-hole work can be safely done at once, or during the years to come.

SCRAPE WHILE DRILLING OUT

The ideal time to use the ROTO-VERT Casing Scraper is during the drilling out of cement, at which time it is run as a "follow-up" behind the bit. Thus in a single run you can also remove all hardened cement, mud, burrs and scale which might later damage swabs or testers, and cause packers or retainers to set prematurely—or never set at all.

EASY TO RUN—LOW-COST RENTAL

The Baker ROTO-VERT Casing Scraper is simple to run, and will effectively clean the inside of the casing *when either rotated or reciprocated* (vertical action). No service man is required, and the low rental cost is paid for many times over by freedom from future damage to bailers, swab rubbers and packers, as well as by the elimination of future delays and re-running expense.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Call Baker for consultation and service . . .

BAKER

ROTOVERT

CASING SCRAPER

PRODUCT NO. 620-C

Good news for gas— but don't cheer yet

THE best news for the gas industry to come out of Washington in a long time is the Federal Power Commission's Panhandle rate decision. But there are some flies in the ointment.

In this revolutionary, far-sighted, and courageous action, FPC abandoned the historic public-utility formula of valuing gas at its cost of production. Instead it now permits a pipeline company to value gas produced by it at the average of field prices obtained by independent producers in the area.

This will end the ridiculous situation of several prices for the same gas from the same field or even the same well. While not helping independent producers directly, this will raise the average price of gas in many areas and make all gas more valuable.

FPC's announced purpose is to encourage transmission companies to own and develop their own gas supplies. They now have some incentive to explore for gas directly, as some are now doing through affiliates.

THIS LOOKS LIKE a turning point in the history of gas regulation, but there are some clouds ahead:

- The Panhandle decision might be reversed by the courts. Or it might be whittled down in subsequent FPC cases. And there could be many arguments over determining the average price, particularly where a pipeline itself owns a dominant portion of the gas in the area.
- Already bills are pending in Congress to annul the Panhandle action by making it mandatory to value pipeline gas at no more than the original cost of the reserves. The consumer interests behind these bills are pressing for early enactment.
- As far as independent producers are concerned, the Panhandle decision, if it sticks, will cure no more than half the mischief of the Phillips case. If the Supreme Court, which now has this case under advisement, requires regulation of producer's sales to pipelines, the FPC will set somewhat higher prices than seemed likely before. But producers will still not be free bargaining agents and will be subject to other onerous phases of regulation.

IT TOOK COURAGE on the part of FPC to raise gas rates and favor producers in the midst of the current hullabaloo over gas regulation in the interest of consumers only. This indicates that the present commissioners have their feet on the ground and realize their obligation to the industry they regulate.

To reinforce this new attitude and make it permanent, the entire petroleum industry should work for early congressional action writing into law the principles of the FPC majority opinions in the Phillips and Panhandle cases.

For Extra Sulphate Resistance

● Where sulphate attack is encountered, it takes a cement with special sulphate-resisting properties to protect casing against corrosion. That is why *extra* sulphate resistance is built into 'STARCOR' Oil-Well Cement and 'INCOR' Sulphate-Resistant Cement. What this means in resistance to sulphate action is shown by tests in Lone Star Oil-Well Cement Research Laboratory.

These bars of neat cement were photographed after exposure to a 4% sodium sulphate solution. The two bars, at left, made with cement without special inbuilt properties of sulphate resistance, show disintegration after 30 days—while the bar at right, made with cement with special sulphate-resisting properties, is unaffected after years of exposure.

For protection against the action of sulphate soils or waters, use 'STARCOR'* Oil-Well Cement or 'INCOR'* Sulphate-Resistant Cement. It pays to select cement to fit the job.

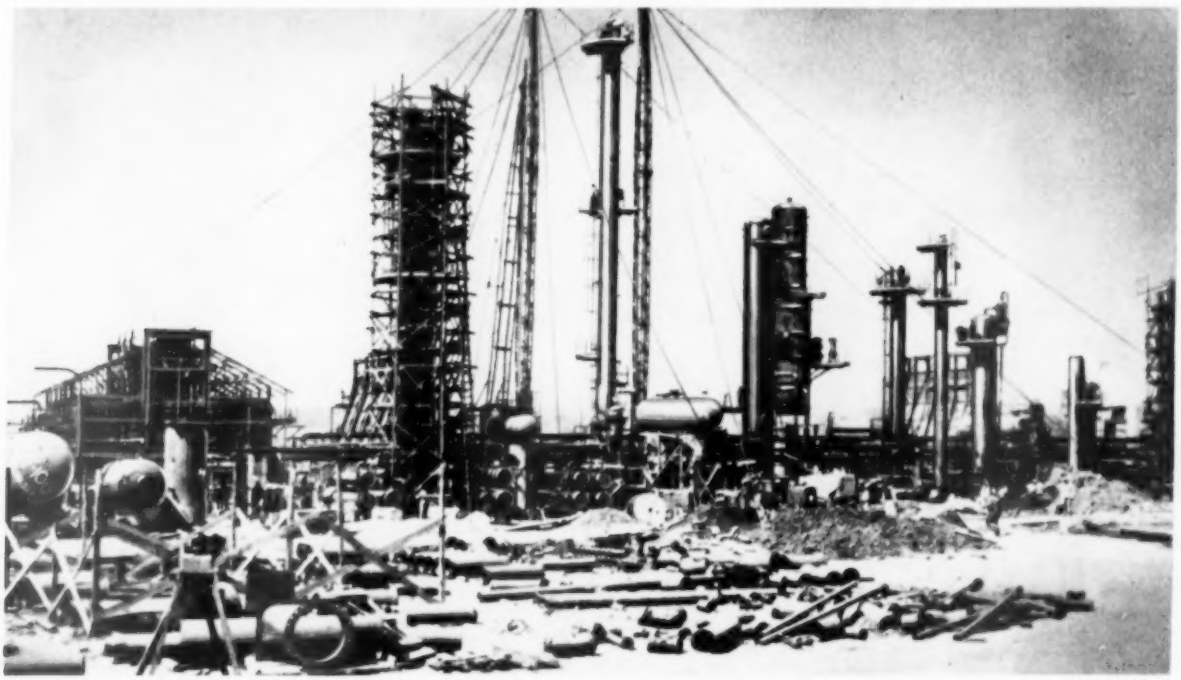
*Reg. U. S. Pat. Off.

Select Cement to Fit the Job!

LONE STAR CEMENT CORPORATION

Offices: DALLAS • HOUSTON • ABILENE, TEX. • NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO. • ALBANY, N. Y. • BETHLEHEM, PA. BOSTON • CHICAGO • INDIANAPOLIS • NEW YORK • NORFOLK • PHILADELPHIA • RICHMOND • ST. LOUIS • WASHINGTON, D. C.

THIS WEEK . . . . . IN THE NEWS



CHILE'S FIRST REFINERY is rapidly taking shape. The 20,000-bbl. refinery is scheduled for completion late this summer. The plant is being built for Empresa Nacional del Petroleo by Kellogg Pan American Corp., a subsidiary of M. W. Kellogg Co., which designed and engineered the refinery. The Chilean refinery will use the latest combination thermal processing equipment to handle both local and imported crudes. Facilities in the combination unit will include atmospheric distillation, visbreaking, thermal reforming, thermal cracking, a gasoline-stabilization plant, and facilities for removing sulfur from fuel gas, L.P.G., and gasoline.

GOVERNMENT—FPC reverses long-standing method of considering production owned by natural-gas pipelines at cost of acquisition for the purposes of setting rates. . . . Commission's new policy is based on a field price for the gas. . . . Abandoned formula called detriment to gas exploration and development. . . .

OFFSHORE—Standard of Texas spuds in first well off Texas since passage of Tidelands Act. . . . Wildcat is 1½ miles east of Padre Island, scheduled to 9,500 ft. . . . Kerr-McGee is contractor. . . . ¶Work begins on new mobile platform for Glasscock Drilling Co. . . . Shell has contracted for use of the Glasscock unit over 5-year period. . . . Platform designed to operate in water as deep as 100 ft. off Texas coast. . . . Delivery scheduled for November 1. . . .

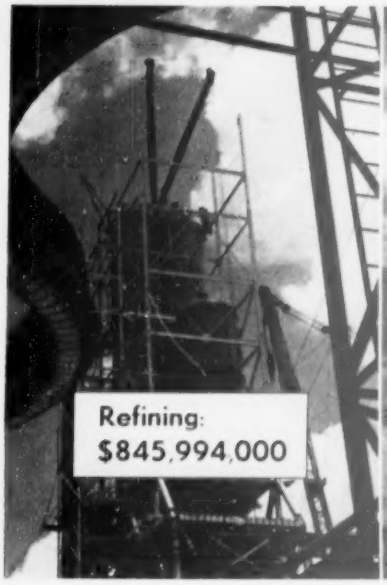
PETROCHEMICALS—Stanolind names Lummus Co. as contractor to revamp Carthage Hydrocol gas-synthesis plant at Brownsville. . . . Key men in new chemical-operations section that will be in charge of gas-synthesis and two affiliated plants also named. . . . ¶Hercules Powder leases Missouri Ordnance Works plant at Louisiana with option to buy. . . . Hercules plans to start ammonia production in the plant within 3 months. . . .

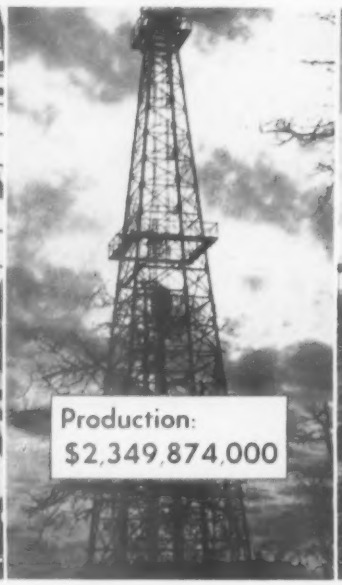
PIPELINES—Natural-gas transmission companies can now determine the feasibility of using combustion gas turbine over conventional reciprocating compressor, N.G.A.A. speaker says. . . . El Paso declares operating costs of turbines are half that of conventional equipment. . . . Defense department refuses to recommend a certificate of essentiality for West Coast Pipe Line Co. . . .

INTERNATIONAL—Esso Standard wildcat in France is apparently best producer drilled to date in western Europe. . . . Well flows at rate of 1,100 bbl. daily on a ¼-in. choke in tests. . . . ¶Egypt faced with task of re-refining first shipment of kerosine from Romania under recent trade agreement with Russia. . . . ¶Rotary rigs running outside United States hit all-time high. . . . ¶Reports from Teheran indicate progress being made by Iranian representatives and team from international consortium. . . .

REFINING—Pros and cons of additives aired during the semiannual session of the National Petroleum Association fail to produce either compromise or slugfest. . . . Opponents agree preignition or deposit-induced ignition is an evasive phenomenon. . . . ¶Construction started on Canadian Petrofina's $20,000,000 refinery at Montreal. . . . ¶Sun Oil sets official opening of its big Sarnia refinery May 15. . . .

NATURAL GASOLINE—Natural Gasoline Association of America members told L.P.G. outlook good for 1954 with sales and production predicted to increase. . . . Need for stepped up sales program stressed to hold markets. . . . ¶George P. Bunn, manager of the gasoline department of Phillips Petroleum Co., receives Hanlon Award, the industry's highest honor. . . . ¶Sun Oil completes expansion at Jameson natural-gasoline plant. . . .





Industry '54 Budget Is Record

A.P.I. says oil industry will spend $4,619,374,000 this year to break domestic, over-all spending records

NEW ORLEANS. — The American Petroleum Institute last week estimated the U. S. oil industry will spend a record $4,619,374,000 in 1954 to expand and develop its resources, both at home and abroad.

This year marks the first time A.P.I. estimates have exceeded four billion dollars on the home front in any calendar year. Only a little more than $600,000,000 is slated for foreign expenditure by American companies in 1954.

The annual estimate of expenditures was announced last week at a meeting of the board of directors of the A.P.I. here. The figures are based on the Institute's biennial survey of capital expenditures for the industry.

Frank M. Porter, A.P.I. president, pointed out that the estimate is the greatest sum of money ever earmarked for expenditure in a single year in the oil industry's history. Porter called it a clear manifestation of the industry's faith in America—and in the current and future business outlook.

"The size of these financial commitments and the fact they are only a one-year segment of the industry's continuing process of modernization and expansion point up two things, in addition to oil's expression of faith in the future—that the companies recognize and are discharging their responsibilities with traditional foresight and that they are keeping themselves geared and prepared for peace or war," Porter declared.

In addition, the investment raises the industry's postwar total for capital expenditures to more than 28 billion dollars—more than double the total investment in plant and equipment in 1945 when the industry was fueling and lubricating the war machine of this nation and her allies.

The 1954 estimate is a 6 per cent increase over last year's total of $4,349,-

Oil Industry Capital Expenditures

(In thousands of dollars)

Production—	Estimated 1954* U.S.	Estimated 1954* Foreign	Actual 1953* U.S.	Actual 1953* Foreign	Actual 1952* U.S.	Actual 1952* Foreign	Actual 1946-51* U.S.	Actual 1946-51* Foreign
Crude oil:								
Leases	369,146	30,783	411,499	34,361	395,858	22,004	1,399,020	96,830
Wells and equipment†	1,658,584	392,388	1,596,429	311,869	1,675,636	303,517	5,826,790	1,141,140
Natural gas:								
Leases	13,741		13,276	82	22,297	395	52,390	230
Wells and equipment†	62,078	2,384	87,963	1,572	60,228	2,366	209,630	6,980
Natural gasoline and cycling plants	143,682	279	108,723		85,175		371,450	280
All other	102,643	10,960	84,130	14,012	86,768	19,226	156,990	76,450
Total production	2,349,874	436,794	2,302,020	361,896	2,325,962	347,508	8,016,270	1,321,910
Transportation—								
Pipe lines:								
Crude-oil lines	87,286	15,247	137,294	3,915	216,875	35,786	694,160	115,590
Product lines	95,427		106,752	16,424	131,017		308,460	
Natural-gas lines	17,423	881	21,962	446	18,544	2,136	119,963	10,880
Marine:								
Tankers	68,186	9,200	73,782	8,471	54,154	19,344	418,260	107,490
Barges	14,331		23,126		11,784		33,850	150
Others	1,423		1,392		1,519		30,430	60
Tank cars	19,259	337	7,388	2,897	24,870	217	79,310	40
Motor transport	8,648	202	13,356	233	12,050	401	71,750	2,090
All other	2,583	352	4,464	227	3,355	903	53,100	1,620
Total transportation	314,566	26,219	389,516	32,613	474,168	58,787	1,809,283	237,920
Refining	845,994	91,722	709,253	60,910	535,629	41,961	2,095,620	253,320
Fertilizer and chemical plants	66,531		65,382		45,925		138,560	
Marketing	370,366	44,339	329,133	30,614	299,235	35,032	1,359,400	144,010
Other	66,868	6,101	60,952	7,216	59,753	3,398	263,855	7,857
Grand total	4,014,199	605,175	3,856,256	493,249	3,740,672	486,686	13,682,988	1,965,017
	(4,619,374)		(4,349,505)		(4,227,358)		(15,648,005)	

*Figures on foreign capital expenditures include those made for consolidated subsidiaries only. †Includes expenditures for intangible development cost of producing wells and dry holes whether capitalized or charged to earnings.

505,000 and Porter added that the new figure may be "somewhat low" because past A.P.I. estimates have been on the conservative side.

"All of these activities, of course, will require a vast and continuing flow of steel and other basic materials, machinery, equipment and innumerable other supplies and commodities," Porter declared. "The expenditures involved are bound to have a healthy and resounding impact on the business prosperity of the supplying communities and the economy of the country as a whole."

The lion's share of 1954 expenditures, as usual, will go into production and development. The new estimate calls for the expenditure of $2,349,874,000 for this segment of the industry. The figure includes funds planned for both oil and gas leases, wells and equipment, in addition to natural gasoline and cycling plants. It represents an increase of nearly $50 million over the sum spent for the same purposes during 1953.

The industry will spend a total of $314,566,000 for transportation facilities with the major portion going for crude, products and natural-gas pipelines. This represents a decrease of some $75,000,000 under the amount spent for the same purposes in 1953.

The industry has slated a record $845,994,000 for new refining facilities this year—an increase of more than $130,000,000 over the money spent for refining last year.

Revamping Job Let

Stanolind also names key Brownsville men

TULSA.—Stanolind Oil & Gas Co. has selected a contractor to revamp the company's recently-acquired Carthage Hydrocol gas synthesis plant at Brownsville, Tex., one of three plants that will be combined to operate as a single unit.

The company also has announced the appointment of key personnel in its new chemical operations section, which will be in charge of the combined operation.

Lummus Co. of New York is scheduled to move into the plant about August 1 to begin revamping portions of the plant and add new construction in some sections. Before acquiring the plant, Stanolind engaged Lummus to evaluate plant facilities and to recommend whether the plant could economically be revamped.

The seven appointments made in the new sections are Paul R. Schultz, manager, chemical plants; Larry L. Smith, superintendent-chemical plants; Gilbert F. Moore, operating superintendent-chemical plants; Duane W. Farnham, synthesis plant superintendent; Fred F. Diwoky, chemical plant superintendent; J. Donaven Wells, chief mechanical engineer-chemical plants; and Joe C. Weaver, Jr., technical supervisor-chemical plants.

Comprising the combined operation will be the Hydrocol plant, Stanolind's adjacent $15,000,000 chemical plant, and the U. S. Industrial Chemicals Co. storage terminal here. *(The Oil and Gas Journal, April 5, page 62).* Stanolind announced March 29 it was exercising its option to acquire the stock and notes of the Carthage company and that it had made arrangements to acquire the U.S.I. terminal.

The combined operation is expected to get under way late next year.

Schultz served as assistant to the executive vice president prior to his promotion to manager of chemical operations. He will be located in Tulsa at Stanolind's general office, but the others will be located in Brownsville. Smith, former superintendent of the chemical plant, will be in charge of the over-all operation in Brownsville.

Gas-Turbine Report

El Paso says its pipeline units show operating costs of less than half those of reciprocal units, N.G.A.A. told

R. J. Enright

DALLAS.—Enough data now is available on the combustion gas turbine to permit any natural-gas transmission company to determine the feasibility of using the turbine in its own individual operation.

Before the gas turbine is adopted, however, for any particular operation, a company should consider carefully certain operational characteristics of the system such as geographical location, sales volume, etc., in addition to a mere weighing of advantages between the turbine and conventional equipment.

This advice was offered by Tracey S. Parks, Tennessee Gas Transmission Co., in a paper appraising the status of the turbine as a prime mover in gas transmission during the thirty-third annual convention here of the Natural Gasoline Association of America.

Currently, Parks said, there are 40 combustion gas turbines in pipeline service. They are operated by seven companies. Though it may appear that the turbine as yet has made little headway, he said, it must be considered that its application in the gas pipeline industry has gained momentum only in the last 2 years.

Cost . . . El Paso Natural Gas Co., one of the first firms to adopt the turbine to any great extent, has come up with some significant figures on operating costs, Parks said.

El Paso, which employs both the turbine and the conventional reciprocating compressor on its system, figures cost of operating the turbine at $8.25 per horsepower per year, not including fuel costs.

It costs El Paso almost three times that amount, $22.10 per horsepower per year, to operate its reciprocal units, again not counting fuel costs, Parks said.

This is, of course, offset to some extent by the higher efficiency of the modern reciprocal unit. Peak efficiency of the turbine now runs about 27 per cent, Parks said, while that of the reciprocal unit is about 35 per cent.

Fuel consumption of the turbine at peak efficiency runs about 8,000 cu. ft. of gas per horsepower per year, he said. Cost of operating supervision runs about the same for both types of prime movers.

Lube-oil performance of the two types of prime movers, he said, runs about 4,000 brake-horsepower hours per gallon for the turbine and ranges from 2,500 to 5,500 brake-horsepower hours per gallon for reciprocal units.

Maintenance . . . Less is known about maintenance of gas-turbine operation than any other factor, Parks said.

So far, gas turbines in service on pipelines have not built up enough operating hours to yield accurate information on maintenance expense.

A rough estimate of turbine maintenance expense can be obtained, however, Parks said. The method involves splitting total maintenance expense into these three categories:

. . . Building and structures. In most cases, these will be fewer and smaller with the turbine, thus less costly to maintain.

. . . Compressor machinery. This includes cost of maintaining the turbine and all auxiliaries.

. . . Other equipment. This takes in all equipment generally furnished by the transmission company such as scrubbers, valves, etc.

In these three categories, Parks said, only the cost of maintaining compressor machinery is not known, the others are pretty well defined. To estimate total maintenance expense, he said, a company should first calculate as closely as possible the cost of maintaining "buildings and structures" and "other equipment." The company then should go outside the transmission industry where turbines have been in use longer and have piled up more operating hours to determine cost of maintaining actual compressor machinery. This figure can be related fairly accurately to a turbine in pipeline service, he said.

GEORGE P. BUNN

Hanlon Award Made

Phillips official gets top natural-gasoline honor

DALLAS.—George P. Bunn, manager of the gasoline department, Phillips Petroleum Co., Bartlesville, Okla., has been awarded the Hanlon Award, highest honor in the natural-gasoline industry and one of the ranking awards in the petroleum industry.

Bunn received the honor during the annual meeting here of the Natural Gasoline Association of America. The presentation was made by former N.G.A.A. President T. R. Goebel, vice president, Columbian Carbon Co., Houston, an old friend of the recipient.

Bunn is the eighteenth recipient of

Next Week . . .

. . . A special feature for Refiners

AN eight-page section on catalyst testing methods will appear in the May 3 issue. The section will outline in detail two tests developed by American Cyanamid Co., one for determining activity and another on particle-size distribution.

Used with routine analytical tests and product inspection, they can be valuable to the refiner operating a fluid cat cracker by helping him:

- Cut down on excessive catalyst loss.
- Correct conditions leading to afterburning.
- Improve product distribution.
- Regenerate catalyst more evenly, completely, and effectively.
- Increase gasoline yield.
- Determine when he is headed for trouble, and prevent it.

the Hanlon Award, which is conferred annually by the N.G.A.A. for outstanding service to the natural-gasoline industry. E. I. Hanlon, chairman of the board of the National Bank of Tulsa, and a pioneer in the natural-gasoline industry, is donor of the award.

Bunn's citation read in part:

"We are recognizing the long-pull helpfulness of this man as a constructive critic, enthusiastic booster, capable engineer and executive. His versatility is striking. There is no phase of our industry with which he is not familiar and his far-reaching interests and attention to details have made him a leading figure in councils of this and other oil trade organizations wherever problems of the natural-gasoline industry were under consideration."

L.P.G. Future Bright

1954 sales, production expected to top 1953, but N.G.A.A. members warned to step up sales effort or lose markets

John C. Reidel

DALLAS.—The liquefied petroleum gas industry will be less affected than most other industries by any recession, W. R. Lund, manager of marketing research for Warren Petroleum Corp., Tulsa, declared here during the thirty-third annual meeting of the Natural Gasoline Association of America.

Lund said the L.P.G. outlook for 1954 is bright, but cautioned that any gain during the year will probably not exceed the gain of 1953. The chemical, motor-fuel, and home-heating markets—all in the early growing stages—are the key to the favorable outlook for the year, Lund said.

In other markets, the outlook is much less favorable and there are indications that some portions of these markets will be lost unless the industry steps up sales efforts. Lund said the need for added salesmanship is caused by increased competition and sales resistance.

Lund pointed out that in most industries, it is possible to study the market outlook without considering production, but said it doesn't work that way with L.P.G. In the natural-gas-liquids business, Lund said, you first try to estimate what production will be, then evaluate the market to see how close production and demand will balance. Many other industries can first judge the market potentialities and gear production to meet the expected demand.

Lund said once production is estimated and the market evaluated, the next—and most important—step is to try to figure out ways of keeping production and demand in balance in a manner that will return the most profit possible to the industry.

Sees more production . . . He predicted L.P.G. and liquefied refinery gas production in 1954 will increase from 8 to 11 per cent to between 6,700,000,000 and 6,800,000,000 gal. This compares to the 1953 output of 6,150,000,000 gal. and is slightly below 1953 increase over 1952.

This increase is based on new plants that will go on stream in 1954, an allowance for higher proration in some areas, and an expected increase in the availability of refinery L.P.G.

In regard to the motor-fuel market, Lund said a substantial part of the reported increase reflects better reporting rather than an actual increase in motor-fuel usage of L.P.G. Other problems that make forecasting the motor-fuel market difficult are, first, the motor fuel uses are scattered in many different fields and, second, conditions vary so widely in different sections of the country that each one has to be considered individually.

Tractor market . . . One of the important factors in the relatively new L.P.G. motor-fuel business is the tractor, but Lund warned that the L.P.G. industry needs to take aggressive action to retain this market. He said six tractor manufacturers are producing L.P.G. tractors, but only one is making any real effort to sell them. Two others are beginning to show some interest, he added.

The 1953 output of L.P.G. tractors was 5,100, but only 3,100 were sold. Lund said the manufacturers cannot be expected to "do the sales job for us." He added that tractors are annually being converted to L.P.G. use, but said the number of conversions should be increasing more rapidly.

In reviewing the L.P.G. market, Lund said the domestic market since 1947 has provided more than 50 per cent of the industry volume, excluding the refinery market, and has accounted for more than 50 per cent of the industry's growth. During the past 5 years, he added, the chemical business has provided 20 per cent of the L.P.G. market increase.

Convention Booth Gives Students Chance to Talk Jobs

More than 150 geology, geophysics and paleontology students, most of whom graduate in June, took advantage of the employment service booth during the recent joint convention of the American Association of Petroleum Geologists, the Society of Exploration Geophysicists and the Society of Economic Paleontologists and Mineralogists in St. Louis. The booth was set up to give students an opportunity to arrange interviews with company representatives and give companies a chance to look over promising prospects. The students who registered with the service averaged about eight interviews each during the convention.

Additives Dispute

Opposing camps draw opposite conclusions, but there's no pitched battle as N.P.A. conducts symposium on deposits

George Weber

CLEVELAND.—The latest skirmish in the mounting controversy revolving about preignition and gasoline additives—a symposium on combustion-chamber deposits—was easily the highlight of the fifty-first semiannual meeting of the National Petroleum Association here.

Attending refiners who expected to see signs of compromise in resolving the problem were disappointed. So were those who anticipated sitting in on a verbal slugfest.

The battle was never joined in the sense of debating merits and demerits of certain additives on a common basis of comparison. The three papers consisted of carefully worded recitals of previously reported findings, which together with three prepared comments, divided about equally in opinions concerning the scope of the problem and the best means for combating it.

The first two papers were presented by the leaders of the two camps: Shell Oil Co. and Standard Oil Co. (N.J.) These representatives of two of the world's most formidable petroleum research organizations held their ground with directly opposing conclusions derived from procedures which did not lend themselves to direct comparison.

General agreement was voiced on one point: Preignition or deposit-induced ignition is an evasive phenomenon. It has no established definition and no generally accepted procedures exist for identifying it and measuring its effect on engine power output. This basic lack of a common ground in research permits of considerable latitude in the choice of approach and the techniques of investigating the basic problem and the testing of possible corrective measures. Hence opinion, both company and personal, is injected into some research programs.

Phosphorus additives good . . . Shell, represented by R. E. Jeffrey and L. W. Griffith led off. They reported the results obtained with tricresyl phosphate (TCP) gasoline additive from laboratory and road tests. By modifying combustion chamber deposits, this additive showed excellent results in alleviating both spark plug fouling and preignition problems, they said.

In the laboratory, using a test method devised to evaluate spark-plug fouling, they found that certain proportions of TCP added to a premium gasoline resulted in well over 100 per cent improvement in spark-plug fouling time. They reported excellent agreement in controlled road tests on cars which were operated alternately with and without the TCP additive in the fuel. These tests showed an increase in spark-plug mileage with TCP additive of from 70 to 150 per cent.

The authors reported another road test conducted on owner-driven cars which were carefully checked before and after using TCP. Out of 14 cars found to be missing, the use of the additive eliminated this malfunctioning in 10 cases, reduced it significantly in two, and the remaining two cars were found to be missing on the recheck because of cracked spark-plug porcelains.

The benefits of TCP in reducing preignition were also cited from laboratory and road tests. Using an electronic counter to measure the abnormal combustion cycles (the "wild ping" test) they found that TCP reduced preignition 50 per cent in laboratory cycle tests. Switching to TCP fuel reduced the abnormal cycle rate in a laboratory engine 12 per cent. Shell reported road tests which checked with these laboratory findings.

Shell reported on their investigations of the possible adverse effects of using TCP. After testing 97 cars and trucks with TCP gasoline in regular day-to-day service for 18 months and an aggregate 1,000,000 miles they reported that careful examination of the engines during and following these tests showed that TCP had no harmful effect on any engine part.

There is no doubt, said the authors, that engine tests can be evolved of such severity that some critical parts can be damaged. These tests measure durability of engine parts and it is most difficult to compare gasoline performance in them, they continued.

In the early stages of their work, they reported, valve burning was encountered when testing phosphorus compounds. The concentration of additive is important in this respect, they claimed, since some concentrations proved undesirable under extreme conditions while others had no effect on valves or other engine parts. Since TCP was introduced in all their marketing areas nearly a year ago, the authors reported that vigorous surveillance has shown that engine performance has been improved and that no engine maintenance problems have been introduced.

Phosphorus additives no good . . . Next came C. L. Fleming, Jr., who presented a paper on "The Control of Combustion Chamber Deposits" on behalf of three other coauthors with Esso Laboratories, Standard Oil Development Co. At the outset, these authors disagreed with Shell on the occurrence of preignition. They presented data from their own surveys, a 1952 CRC survey and a Sun Oil Co. survey which showed that for some 512 late model cars, less than 10 per cent were preignition limited.

Moreover, many of these cars had preignition requirements below the octane levels of existing premium fuels, they said. Only a very small proportion, probably less than 1 to 2 per cent of the cars on the road have preignition requirements above the octane levels of existing premium fuels, the authors concluded. They say that detonation rather than preignition is the limiting factor in determining car octane requirements in the field today.

The authors also dismissed spark plug fouling as a serious problem. They showed results of three field surveys covering 164 cars, which reported that 6 cars, or 4 per cent of the total needed plugs replaced after road test runs of 5,000 to 10,000 miles.

The Esso authors then presented their conception of the soundest approach to solving the combustion chamber deposit problem—the elimination or reduction of amount of deposits formed. Their data illustrated a 30 to 40 per cent reduction in engine deposits in switching from a conventional SAE 30 MIL-0-2104 or a SAE 10 mineral oil, to the new SAE 5W-20 and SAE 10W-30 oils. This amounted to a lowering of octane requirements by 5 or 6 numbers. Use of 5W-20 oil as compared with the SAE 30 noted above, also reduced from 40 to 17 per cent, the observations showing preignition requirement exceeding detonation requirement in a controlled field test with an overhead valve, V-type engine.

The beneficial effects of using fuels with higher back end volatility were also cited. In reducing the 90 per cent point to 300-320° F. as contrasted with fuels with 340-360° F. 90 per cent points, they reported substantial reductions in harmful effects of deposits formed from the fuel, particularly with respect to preignition tendencies.

The authors then turned their attention to tricresyl phosphate. Pointing

to the fact that of the lead salts found in combustion chambers, the phosphate is the highest melting and least volatile, they presented data showing 20 to 30 per cent increases in weight of deposits when using 0.2 theories of tricresyl phosphate. The effect of these added deposits, they pointed out, was to increase the octane requirement of the fuel to satisfy detonation requirements.

Their test data led them to suggest that with high-quality fuels and lubricants, preignition may not necessarily be a problem as compression ratios increase. Based on evidence available to them, they concluded there was no sound demonstration of a clear cut advantage for the use of tricresyl phosphate in low to moderate concentrations in reducing octane requirements. There are considerable data indicating tricresyl phosphate actually increases octane requirements in present day cars, they said, and limited data indicate that tricresyl phosphate will increase requirements of future high compression ratio cars also.

The authors reiterated their company's stand that preignition and spark plug fouling are not pressing problems today, and plugged their solution to the combustion chamber deposit problem as one employing high quality fuels and lubricants with low deposit forming tendencies.

They declared that phosphorus additives were not attractive. They granted that they reduced preignition tendencies but claimed they caused marked increases in octane requirements. They also concluded from their tests that phosphorus in gasoline also has an adverse effect on power, fuel economy and valve life.

Moderate view . . . In the third paper on the subject, H. J. Gibson and H. E. Hesselberg of Ethyl Corp. took a moderate view of the preignition problem. They believe that the preignition problem exists to a degree which is undetermined, but which is larger than is generally realized. They then turned their attention to audible and inaudible preignition.

"The question may well be raised—why worry about preignition you cannot hear? Practically, in modern automobiles there is probably not much point in being concerned about the effect of inaudible preignition on engine durability provided that the engine is not operated under a heavy load for a long period of time. However, it can result in power loss and engine roughness, and today's inaudible preignition may be audible tomorrow."

They then tended to reconcile the conflicting reports on incidence of preignition. Winch of Sun Oil Co., who measured total preignition reported a high incidence, while Tongberg, of Esso, whose survey was based on noise alone, reported that only a small percentage of cars were preignition-limited. Further complication is introduced by differing interpretations of the same survey data, they said.

The authors cited improved lubricants and fuels of higher volatility as important contributions. They also noted that improved engine design, such as the change from the ell-head to valve-in-head construction, had contributed substantially to control of preignition.

Turning to Ethyl's ignition-control compound, they stated that this compound and other phosphorus additives are effective in reducing preignition and in sufficient concentration, they can control preignition completely.

"Data are available to indicate that the use of phosphorus additives with some fuel-oil-engine combinations reduces the antiknock requirements for ordinary knock," said the authors. "It appears however, that there may be an average increase in the range of from zero to about one-half octane number as a result of the use of the present commercial concentrations. Any increase means, of course, that a fuel of given octane number satisfies the ordinary knock requirements of fewer cars after use of the additive than before. The user must balance against this the gains to be made by reducing preignition. An important point to consider is the fact that the cars that are preignition limited are likely to be those having the highest requirements. Reduction in the noise requirements of these preignition-limited vehicles by use of an additive makes it possible to satisfy a larger percentage of the critical cars at any chosen octane number level."

The Ethyl men noted no indication that their additive has an adverse effect on the durability of passenger cars in normal service. They conceded that in certain engines and under severe operating conditions it can be demonstrated that phosphorus compounds reduce exhaust valve durability. Generally speaking, only engines that are marginal from a valve durability standpoint will suffer reduced valve life, they concluded.

Further views . . . In commenting on the three papers, W. E. Kuhn of The Texas Co. stated that his company's findings agreed with Esso's regarding the effect of phosphorus additives on combustion-chamber deposit buildup.

His company does not consider spark-plug fouling a pressing problem today. Texaco feels that non-phosphorus additives will provide a better answer to the problem and are following this conviction with a hydrocarbon additive which reduces rather than increases octane requirement buildup.

J. C. Geniesse of Atlantic Refining Co. reported that his company had found that phosphorus additives reduced inaudible preignition. He agreed with Esso in the gains to be realized by using improved lube oils, but warned refiners to watch oil consumption closely. J. G. Moxey, Jr. of Sun Oil Co. conceded that preignition is a major problem today. He reported that his company's testing program had left them unconvinced that phosphorus additives gave enough benefits to offset the disadvantages. The lube-oil route, developing specially designed oils, he said, was very effective in reducing octane requirement increase and preignition.

Florida Well Completed

MIAMI.—Gulf Oil Corp. has completed the 1 State of Florida-Lease 340, about 3½ miles east of the discovery well of new Forty Mile Bend pool in Dade County.

The discovery pumped 113 bbl. of 21.2°-gravity oil plus 400 bbl. of salt water per day from open hole in the Sunniland lime at 11,340-352 ft.

Forty Mile Bend pool, opened in February by Commonwealth Oil Co.'s 1 Wiseheart-State of Florida, is about 40 miles southeast of Humble Oil & Refining Co.'s Sunniland field in Collier County, until recently the state's only other production.

Industry Briefs

LONG BEACH, Calif.—Cash royalties received by this city from three oil leases in Signal Hill field over a 33-year period totaled $15,454,316.80 at the end of the last fiscal year. Dry gas delivered free to the city was valued at $462,710.45, increasing revenue to $15,917,027.25. Monterey-Wilmington Associates pays 20 per cent royalties. Richfield Oil Corp.'s royalties range from 22 to 30 per cent and Shell Oil Co.'s lease provides 16.67 per cent payment.

LOS ANGELES. — An expenditure of $950,000 for additions at its Brea research center near here has been approved by the executive committee of Union Oil Co. of California. From 4 to 6 months will be required for design work and then 10 to 12 months will be needed for construction.

". . . policies designed to encourage, rather than penalize natural-gas exploration. . ."*

FPC Reverses Gas Rate Policy

- **Commission abandons acquisition cost as rate basis for pipeline companies producing own natural gas**
- **Pipelines should produce "substantial" portion of gas they transport, FPC says in Panhandle Eastern case**

WASHINGTON.—Natural-gas pipeline companies last week won their long fight to have the Federal Power Commission consider field price rather than cost of acquisition of their own gas in setting rates.

Noting that it was a "transition" to a more realistic approach to the pricing of such gas, the commission rejected the traditional cost-base recommended by its staff. The commission ruled the public interest would be served better by permitting Panhandle Eastern Pipe Line Co. to receive for the gas it produces a price reflecting the weighted average of payments made in arm's-length contracts for identical gas in the fields where it is produced.

Under this ruling, Panhandle was given approximately 10 times as much for its gas as it would have received under the previous cost-base policy. The commission estimated that the new method will allow the company an average price of 8.4398 cents per thousand cubic feet for its own gas against a maximum of .85 cent per thousand under the cost approach.

The abandonment of the old acquisition-cost basis was approved by the commission by a 4-to-1 vote with Commissioner Claude L. Draper dissenting.

New philosophy . . . The new philosophy of the commission, it was explained, is to encourage, rather than penalize, natural gas exploration, development and production by the pipeline systems.

The position taken by its staff, the FPC said in its opinion, gave only "scant" attention to the economic aspects of the question and the long-run economic consequences of the cost basis. It was apparently based primarily on the fact that this had been the commission's long established policy which has been sanctioned by the Supreme Court.

The court decisions, the commission held, do not preclude it from dealing with this economic matter in accordance with "its experience and best judgment as to what constitutes sound public policy."

Laying the groundwork for its decision, the commission pointed out that while the staff estimated its cost approach would result in valuing Panhandle's produced gas at a maximum of .85 cent per 1,000 cu. ft., the company claimed it would produce a minus valuation of 1.24 cents per 1,000 cu. ft. The commission also noted that in certain instances Panhandle's partners in particular wells earn after all expenses and taxes from 5 to 5.6 cents, receiving a price of 8 to 9.8 cents, while lessors and royalty owners are paid for gas produced from the same well at a rate of 9 cents per 1,000 cu. ft.

Reasoning behind it . . . There is no sound reason, the FTC said, why it should arbitrarily treat the natural gas of some producers according to a completely different method from that used in the case of gas produced by others. Not only is such a situation incongruous, it held, but "there is the fundamental and paramount question whether such result would be in the public interest, and whether it would even be in the ultimate interest of the consumers who have come to rely increasingly upon natural gas as a major source of their expanding energy requirements.

"Obviously," it was pointed out, "an arbitrarily depressed price, related to what may truly turn out to be a 'vanishing rate-base,' would tend to both accelerate the consumption and fail to

Left to right, Commissioner Dale E. Doty, Vice Chairman Claude L. Draper, Chairman Jerome K. Kuykendall, Commissioner Nelson Lee Smith, and Commissioner Seaborn L. Digby.

encourage the discovery and development of this limited and irreplaceable natural resource."

More than equity involved . . . The FPC's decision was based on more than merely the equity of such treatment and involves a new idea that production by the pipelines is in the public interest.

The commission advanced several reasons why it believes the pipelines should produce a "substantial" portion of the natural gas they transport and sell:

. . . Production strengthens a pipeline's bargaining position in negotiating gas-purchase contracts with independent producers.

"We are convinced that companies not wholly dependent upon arm's length purchases for their entire supplies are generally able to buy gas more advantageously," the commission said. "This advantage must ultimately redound to the benefit of their customers through lower gas-purchase prices and cost of service . . ."

. . . Using its own production to level fluctuations of seasonal consumer demands, a pipeline is able to purchase its gas supply under minimum take provisions at a lower cost and a resulting lower rate to its customers.

. . . Consumer interest is served far better when a pipeline serving markets remote from production has a gas supply adequate to meet needs than when low rates can be figured "on paper" based on a supply that it not actually present for purchase.

"If there is to be natural-gas exploration, development and production by pipeline systems themselves, with resultant benefits to the public interest, it follows that this must result from regulatory policies designed to encourage, rather than to penalize, such activities,' it concluded.

"When we look to the over-all situation, we cannot but be struck by the fact that no new major pipeline certified since the commission's pricing practice was first established — including some of the largest systems serving enormous new markets—produces any significant portion of its total supply. That the ratio of pipeline-produced to total gas transported and sold in interstate commerce has declined markedly is clearly apparent from the facts of record."

Draper questioned the commission's authority to abandon the acquisition-cost base in favor of field price, and argued that even though legal such a policy should not be adopted.

Although the commission is not bound to the use of a single formula in determining rates, Draper said, "whatever formula we use must be within the limits of the conventional pattern so long recognized and approved by the courts."

Refunds coming up . . . The "new look" in FPC regulation was unveiled in a decision granting Panhandle an increase of $12,778,864 annually out of $21,400,000 sought by the company in August 1951 and permitted to go into effect under bond in February 1952.

The refusal to grant the company all it sought will result in refunds to Panhandle's 48 utility customers in Kansas, Indiana, Missouri, Ohio, Illinois and Michigan.

Tax Relief Urged

Senate told refiners need flexible tax depreciation

WASHINGTON.—Independent refiners think that there's too much refining capacity in this country, but that some of it might be taken out of use when not needed if the tax laws were rewritten to encourage this.

A way to achieve this has been laid before the Senate finance committee by the Independent Refiners Association of America. Elmer E. Batzell, association counsel, urged the Senate to adopt a flexible depreciation policy written by the House during its consideration of the tax-revision bill.

"As a result of strenuous efforts to increase industrial production against the day when it might be needed to supply industrial and military activity in times of emergency, a considerable excess productive capacity has been developed which creates grave economic problems for individual businessmen," Batzell explained.

"This is especially true in industries such as petroleum refining. The impact of this excess capacity upon the independent refiner, when it continues to be used without restraint, threatens the very existence of this small but significantly important segment of the petroleum industry."

Batzell told the committee that while the independent refiners would prefer a depreciation policy under which each taxpayer would be permitted to select the rate at which he would depreciate his facilities, the provisions written by the House were a great improvement over the present law.

Depreciation based on physical life of existing equipment cannot take into account the higher replacement costs of those facilities, he explained. The new processes which frequently make facilities obsolete in a quarter to half their useful physical life have invariably required increases in the size of basic refining facilities to obtain maximum efficient operation, and the new processes themselves are more expensive than those which they replace.

"These characteristics make it imperative to have a revised depreciation policy, such as that now proposed, if aggressive economic and technological development is to continue and the participation of the smaller refiner in that development is to be made possible," Batzell declared.

Trade Law Doubtful

Congress not likely to pass foreign trade legislation

WASHINGTON. — The administration's foreign trade policy has been introduced in Congress but there is little likelihood that it will be enacted into law this year.

The bill, introduced by Rep. Robert W. Kean of New Jersey, would extend the Reciprocal Trade Act, now due to expire June 12, for 3 years. It would not permit the President to enter into new trade agreements, but would allow him to reduce existing tariff rates by 5 per cent each year.

The bill, as were the President's recommendations which were incorporated, is based on the report of the Randall Commission of Foreign Economic Policy.

The commission's report, however, drew fully as much criticism as acclaim from members of Congress. There is little prospect that Rep. Daniel Reed of New York, chairman of the House ways and means committee, and Rep. Richard M. Simpson of Pennsylvania, second ranking Republican member, will give much consideration to the bill. Both strongly opposed the Randall recommendations and the bill must be passed upon by their committee.

Observers in Washington believe the most the President will get in the way of foreign trade legislation is a 1 or 2-year extension of the present law. This is given support by the deferment of committee consideration for at least a month, making it practically impossible to settle all controversies and pass the bill in the limited time of the session then remaining.

New Fuel Study Planned

WASHINGTON.—The Senate interior committee plans to make another study of fuel reserves this year with a view of formulating a national fuel policy.

The committee last year secured

Senate authority for an investigation to be completed last February, but has been given additional time. It's authority now runs until next January 31.

A minerals, materials and fuels subcommittee under Senator George W. Malone of Nevada has been making a study of the wartime availability of oil and minerals. It is scheduled to file its final report by June 30, but will do so at least a month earlier, if possible.

Plant Sales Speeded

Government hastens disposal of synthetic rubber plants

WASHINGTON. — Negotiations for disposal of the Government's 27 synthetic rubber producing facilities will be speeded up as much as possible, so the complete sale plan required by Congress may be completed by the January 31, 1955, deadline.

The Rubber Producing Facilities Disposal Commission advised prospective purchasers last week that negotiations will be held from May 27, the final date for the submission of bids, until next December 27. But it hopes to complete the bargaining talks in advance of the latter date.

This will give the commission more time to prepare and execute sales contracts, submit the program to the attorney general for approval, and prepare its report for Congress.

This plan, however, will not operate to cut off any bidder who requires time, even to December 27, to complete his negotiations.

The commission also announced that, in line with suggestions received from possible purchasers, it has relaxed some of the provisions of the national security clause with which oil, chemical, and other companies interested in the plants had pointed out it would be difficult to comply.

Bureau Seeks Bonus Offers

WASHINGTON.—Bonus offers for leases on two 40-acre parcels of California oil lands are being invited by the Bureau of Land Management, to be opened May 12.

One of the parcels is in the known geologic structure of the Buena Vista Hills, Kern County, oil and gas field and is in the area of the cooperative agreement for development of that field. The other is in the known geologic structure of the Wheeler Ridge field, also in Kern County.

Leases will be awarded the qualified bidders of the highest cash bonuses on the usual rental and royalty terms.

WATCHING WASHINGTON

Bertram F. Linz

Mines Bother Council

The National Security Council's concern with developing emergency overland transportation of 1,000,000 bbl. of oil daily for the East Coast can be explained in one word — mines.

Naval officials testifying before congressional committees recently admitted "acute concern" over the possibility that the United States might practically be blockaded in another war by mines sown in coastal waters.

A great deal of research is being done on what is admitted to be one of the knottiest problems the Navy has had to deal with during the past few years, and experts say frankly that the science of mine countermeasures must make great strides if it is to keep step with the new and complex mines being developed.

Officials believe that the capacity exists in foreign powers for delivering large numbers of highly destructive mines by submarine and placing them where they would threaten to blockade our coastal shipping lanes. It is considered imperative that adequate pipeline facilities be developed against that emergency, to prevent a recurrence of the oil shortage experienced along the highly industrialized East Coast in 1942.

Gas Policy Effects

The new policy of the Federal Power Commission permitting natural-gas transmission companies to value their own production at the average field price will get a going-over in Congress, but it is doubtful any effort to write the discarded original-cost theory into law will be successful this year.

A Senate commerce subcommittee has announced it will hold hearings early next month on the bill by Sen. Homer Ferguson of Michigan to amend Section 6 of the Natural Gas Act to provide that "the value for ratemaking purposes of gas reserves held by any natural-gas company shall in no case be deemed to exceed the actual original cost of such reserves to such company."

Rep. Charles D. Oakman and Rep. Louis C. Rabaut both of Michigan, introduced identical legislation in the House, and appeared before the House commerce committee 2 weeks ago to plead for early hearings on the measure.

Criticism of the new policy by congressmen from the consuming areas has been bitter, but the FPC's statement that it seeks to encourage, rather than penalize, exploration, development and production by the pipeline systems is in line with administration policy. It probably would be firmly supported by President Eisenhower if the issue ever came before him.

Big Refiners Slip

The Federal Trade Commission finds that big business is getting bigger, but this may not hold true for the oil refining industry where the eight largest companies appear to be barely holding their own.

A study of economic concentration, based on a survey by the commission of the 200 largest companies in the country, shows that group increased its dollar share of manufactured output by 2.8 per cent between 1935 and 1950. Between 1935 and 1947, however, the share of the eight largest refining companies actually dropped, from 58.9 to 58.8 per cent.

It is not the very largest companies that are expanding most, but those that could be classified as not quite the largest. The 100 top companies in all industry increased their dollar proportion by only 0.9 per cent. It was the much greater gains of the next 100 that brought the increase for 200 companies to 2.8 per cent.

Similarly, in the refining industry it was the largest companies that registered the greatest loss—from 38.2 to 37.3 per cent for the top four.

The commission's study was purely factual. It was limited to an analysis of concentration and not concerned with its effects, that is, whether or not any particular level of concentration has desirable or undesirable effects upon the economy.

One factor to be borne in mind—data on which the FPC based its findings is 3 to 6 years old and does not reflect the effect of the Korean situation and the industrial expansion program.

Money Question

Top court asked to rule on oil use of old U. S. scrip

WASHINGTON. — The Supreme Court was asked last week to determine whether scrip issued by the Government nearly a century ago is still valid currency for the acquisition of oil and mineral-bearing public lands.

The case before the court involves a claim by West Coast Exploration Co. to sodium lands in California. But, its decision will affect also scrip claims to oil lands which were first asserted in 1946, to the submerged lands off the California coast and later extended to Louisiana and Texas tidelands.

The company's claim was rejected by the Interior Department, and an appellate court decision held the department had the authority to take that action.

In November 1951 former Interior Secretary Oscar L. Chapman rejected 11 applications for title to offshore oil lands through the use of scrip, but the 14-page solicitor's opinion on which his decision was based did not go deeply into the question of the current negotiability of scrip. It was primarily directed to the point that the tidelands did not fit under any of the laws which authorized the issuance of scrip to encourage homesteading on public lands.

In passing, however, the solicitor did comment on a point involved in the sodium case. He held that most of the areas involved in the scrip applications were known at the time of application to be valuable oil properties. While the laws under which the scrip was issued, directly or by implication, limited land selections to nonmineral lands.

Committee To Stay

Foreign oil supply group to continue in operation

WASHINGTON. — Continuance of the Foreign Petroleum Supply Committee under the Oil and Gas Division has been approved by Attorney General Herbert Brownell, Jr., and Mobilization Director Arthur S. Flemming is requesting the participating companies to accept the amended voluntary agreement.

The committee was originally created as an arm of the Petroleum Administration for Defense in 1951 as a result of the cutting off of Iranian oil. Its purpose was to determine schedules for world-wide operations and movement of petroleum to assure adequate amounts for all friendly foreign countries.

With the end of the Iranian emergency, the voluntary agreement was revised last May to provide the Defense Department and the mobilization agencies with continuing information on world supply and demand.

With the liquidation of PAD, its remaining functions will be transferred to the Oil and Gas Division. It was necessary to secure the approval of the Department of Justice and Federal Trade Commission for continuance of the voluntary agreement. The only changes in the agreement are technical, substituting Interior Department officials where mobilization officials originally were named.

New Public Land Law Likely

WASHINGTON. — Legislation providing for the simultaneous development of the oil and mineral resources of the public lands appears to have a good chance of enactment before Congress adjourns.

Interior Department support has been given measures now pending in both Senate and House which would permit the mining of minerals, particularly uranium, on oil lands which are leased for petroleum development.

In providing for multiple operations, the rights of both oil operators and miners would be safeguarded.

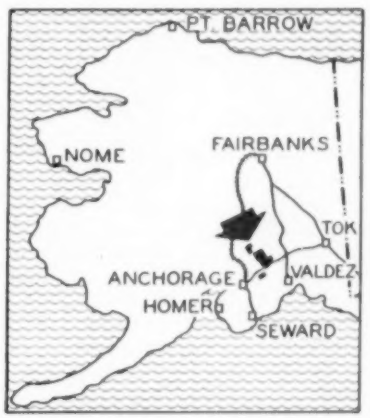
MEETINGS

Pipeline Meeting Planned

PHILADELPHIA.—The fifth annual spring products pipeline conference of the American Petroleum Institute's Division of Transportation will be in the Warwick Hotel here May 10-12.

Papers scheduled to be presented and their authors include: "The Performance of an Oil-soluble Anti-Rust Agent in Products Pipelines," Stanley Kleinheksel, Socony-Vacuum Oil Co., Inc., Plainfield, N. J. and P. Lawrence and F. L. Nelson, Socony-Vacuum, Paulsboro, N. J.; "Putting a New Products Line into Operation," L. B. Moon, Sinclair Pipe Line Co., Independence, Kans.; "Platte Pipe Line Co.'s Application of Recent Developments in Telemetering and Supervisory Controls," Allen R. Heidebrecht and Fred S. Jones, Platte Pipe Line Co., Kansas City; "Warehousing Methods and Procedures on a Products Pipeline," J. A. Hatfield, Plantation Pipe Line Co., Baton Rogue, La.; "Maintenance and Operation of Storage Tanks and Associated Equipment," E. E. Mincheff, Great Lakes Pipe Line Co., Kansas City; and "Progress Report on Large-Capacity Pipeline Meter-Proving Practices," M. L. Barrett, Jr., Shell Oil Co., New York, and R. E. Speckmann, Shell, East Chicago, Ind.

ALASKA



Interior Test Set

New independent company to resume cable-tool test

ANCHORAGE.—Drilling will be resumed before May 1 on a rank wildcat in an unexplored area of southeastern Alaska.

The well was started late last year by Alaska Oil & Gas Development Co., Inc., which was formed in 1952 by a group of Alaskan business men to explore for oil in the Alaskan interior.

The company is drilling on a 78,058-acre block in the Eureka-Nelchina area about 125 miles northeast of Anchorage on the Glenn Highway *(see map)*. The well, being drilled with a cable-tool rig, was suspended in November at a depth of 717 ft. The company set 17-in. surface pipe at this depth, plans to set 16-in. casing at 1,500 ft., and has 10, 8, and 6-in. casing on order.

The location was staked following geological work last year by D. H. Thornburg, Van Nuys, Calif., consultant. The location is 300 ft. off the highway.

In a recently issued prospectus, the company said it plans to complete its first test this year and drill additional wells in 1955 and 1956.

The area being explored is 150 miles northwest of the Katalla-Yakataga area, where Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., are undertaking a joint 10-year exploration project on a million-acre block extending 120 miles along the southern coast *(The Oil and Gas Journal, June 22, 1953, page 144)*.

Officers of the new company are C. F. Shield, president and general manager; N. F. Nelson, vice president, and William A. O'Neill, secretary-treasurer. Directors are Carl Williams, P. L. Parker, Nelson, Shield, and O'Neill.

Offshore Test Spudded

Standard of Texas starts first well off Texas Gulf Coast since tidelands row; Gulf and Sun stake other locations

HOUSTON. — Standard Oil Co. of Texas has spudded in the first well to be drilled in the Gulf of Mexico off Texas since the passage of the Submerged Lands Act by Congress.

The 9,500-ft. wildcat is about 1½ miles due east of Padre Island, Kleberg County, and is within the state-controlled portion of Gulf waters 35 miles south of Port Aransas.

The initial test, being drilled by Kerr-McGee Oil Industries, Inc., is in what is known as the "Quail" area on a 640-acre tract which the company acquired at the record-breaking land sale last December.

The rig is on a four-well platform which stands in 38 ft. of water. The platform, built by Brown & Root, Inc., will be used to drill three directional wells after the initial test is completed.

Sixteen-inch conductor pipe was set at 200 ft., and 10¾-in. casing will be run at 2,500 ft.

A spokesman for Standard of Texas said that another platform would be installed in the "Sand Hills" area, about 3 miles off Padre Island, shortly.

Spudding delayed . . . The operation was delayed 2 months when heavy seas and high winds swamped a barge carrying the lower jacket assembly of the drilling platform, driving the barge ashore at Padre Island. The barge later sprang a leak, dumping the section in 65 ft. of water. Several weeks were spent fishing the assembly out of the heavy seas and getting it repaired and back into position.

A converted yard freighter is being used as a tender ship for the platform.

Standard of Texas' offshore-drilling program will be confined wholly within the state-owned area of the gulf. The company does not have any leases on the Continental Shelf which is controlled by the Government.

. . . Gulf Stakes One

HOUSTON.—The first test well on an expensive 5,760-acre lease in the Gulf of Mexico will be started by Gulf Oil Corp. here around June 1. Location is in State Tract L-774, east of Mustang Island, Nueces County.

The company recently completed new floating drilling equipment including a drilling tender converted from a war-surplus LST.

Location is 6,000 ft. north of the south line of Block L-774, and 3,500 ft. west of the east line, approximately 8½ miles south-southeast of Port Aransas on Mustang Island. Water over the drilling site is about 50 ft. deep.

. . . And Sun Another

HOUSTON.—Sun Oil Co. has staked location for an 11,000-ft. wildcat test in the Gulf of Mexico off Kleberg County about 1½ miles northwest of a spot where Standard Oil Co. of Texas is now drilling from a platform.

Sun's new location is 37½ miles east of Kingsville, and about 4½ miles southeast of Bird Island field. The operation presumably is to be carried out on a 52 by 106-ft. drilling platform, served by a tender ship.

Sun's plans call for directional drilling of several wells from the same platform if production is found.

The company has permits from the U. S. Engineer Corps to drill as far as 4½ miles from the shores of Padre and Nueces counties.

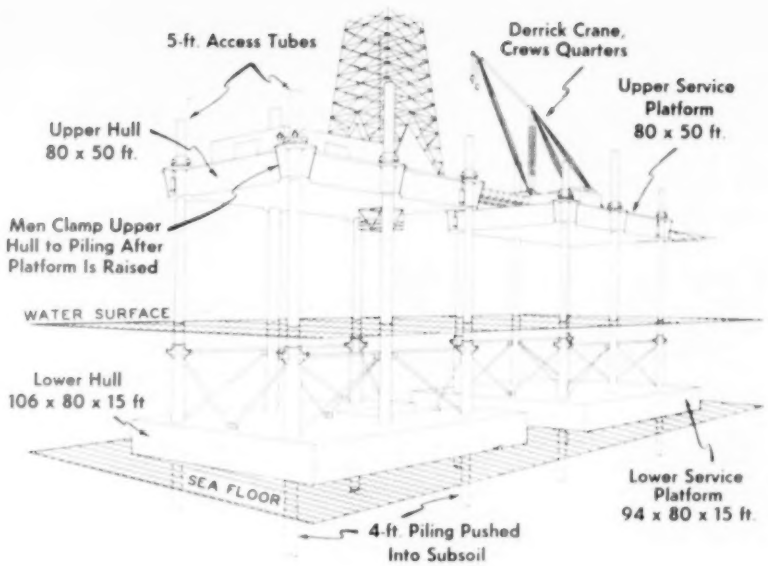
Record Louisiana Bid Made

BATON ROUGE.—Four companies offered Louisiana a record $3,127,668 bonus for a 2,018-acre lease in Timbalier bay area off Terrebonne and Lafourche parishes as the state opened its offshore lands for leasing for the first time in 6 years.

The bid was submitted by a recently formed joint venture by Sinclair Oil & Gas Co., Sohio Petroleum Co., El Paso Natural Gas Co., and Peoples Production Co.

Spindletop Gusher—Hollywood Style

It took the ingenuity of some oil technicians, but Hollywood managed to produce a gusher that had the outward appearance of a true-to-life blowing wildcat. The fabricated gusher was produced for Du Pont Co. in connection with the filming of the story of Spindletop for Du Pont's television series, "Cavalcade of America."


5-ft. Access Tubes
Derrick Crane, Crews Quarters
Upper Service Platform 80 x 50 ft.
Upper Hull 80 x 50 ft.
Men Clamp Upper Hull to Piling After Platform Is Raised
WATER SURFACE
Lower Hull 106 x 80 x 15 ft
SEA FLOOR
Lower Service Platform 94 x 80 x 15 ft.
4-ft. Piling Pushed Into Subsoil

New Platform Idea

Work started on new-type offshore drilling unit; Shell contracts with Glasscock for 5-year offshore oil search

William P. Sterne

CORPUS CHRISTI.—A contract has been negotiated between Shell Oil Co., Houston, and G. C. Glasscock Drilling Co. here which calls for the use of a radical new "mobile platform" off the Texas coast.

Under the contract, Shell must keep the new platform in operation at least 120 days a year for the next 5 years. The first drilling will get under way shortly after November 1, when Glasscock is expected to take delivery on the new unit from Bethlehem Shipyards, Beaumont.

Construction of this unusual mobile platform—which is, in effect, a barge—was begun in Beaumont last week. Glasscock's contract with Bethlehem specifies that the entire unit be completed and in the hands of the contractor by November 1.

Neither Shell nor Glasscock would pinpoint location of the first wildcat, but it is reported that the initial test will be somewhere in deep water off the South Texas coast, probably east of Corpus Christi. Shell acquired some choice blocks of tidelands leases east of Mustang Island, off Nueces County, at the record land sale in Austin last December 1.

Design . . . The mobile platform was developed by Bethlehem. It consists of two hulls, an upper section 80 by 50 ft., having a service platform of the same dimensions; and a lower hull, 106 by 80 by 15 ft., having a service platform of 94 by 80 by 15 ft. *(See drawing).*

The platform will be fitted by 4-ft.-diameter piling, and access tubes running from the upper hull to the lower hull will be 5 ft. in diameter, big enough to accommodate men who must go down them to clamp the lower hull to the piling.

How it works . . . The mobile platform will be towed to location by tugs.

After reaching location, the platform will drop its own "built-in" piling to the bottom of the ocean, forcing it into the silt by hydraulic jacks actuated from the upper hull. Weight of the upper hull is applied to two diagonally opposite piles at a time, until the desired depth of penetration is obtained.

The upper hull will then be clamped to the piles, and the lower hull will be submerged by flooding with sea water and exerting downward pressure on it with the 5-ft. access tubes.

Men will then go down these 5-ft. tubes, clamping the lower hull to the piles already sunk to the ocean floor.

In raising operations, the two units will be lifted in a reverse manner, with the hydraulic jacks being used to pull up the piling.

To solve problems . . . This new floating platform is designed to operate in Gulf of Mexico waters as deep as 100 ft., but it can also operate in water as shallow as 13 ft.

J. C. Storm, drilling superintendent for Glasscock here, said his company feels the new design will solve many problems to be encountered off the Texas coast which are not found in operations off Louisiana.

For instance, heavy ground swells, high waves, prevailing winds of from 25 to 40 m.p.h., and the much deeper waters along the South Texas coast will have to be contended with.

"Any operator can withstand a quick squall, but when the winds prevail from 25 to 40 m.p.h. all the time, that's another matter," he said.

The new mobile platform promises to whip these problems but Storm pointed out that even with the radical design, the real test of performance under these conditions must await actual operation of the unit.

SOUTHWEST

Flood Permits Asked

Commission approves four secondary-recovery plans

AUSTIN.—The Texas Railroad Commission heard applications for permits to conduct four water floods and one gas-injection program last week.

The commission also approved applications for two water floods, one gas and one air-injection project.

Largest of the secondary-recovery projects was described in an application filed by Woodson Oil Co. for the Strawn sand in Manning-Harrington field of Throckmorton County, North Texas.

W. R. Stearns, Austin consultant for Woodson, told a commission examiner the company expects to recover an additional 3,390,000 bbl. of oil from the 1,100-acre pool.

He said that efforts are under way to unitize the field and that this should be accomplished in the near future, also that gas-injection operations which were started in February will be continued as long as feasible.

The field to February 1, Stearns said, had produced about 2,676,549 bbl. of oil from 37 wells in the Strawn at 3,900 ft. Water flood would be obtained from the Canyon zone and probably injected in a closed-type system, he said.

The four other applications were filed by:

. . . Suxon Exploration Co. for a water flood in the Morris and Gardner sands in Saxon-Guion field, Taylor

County, North Texas. Combined productive acreage of two sands was placed at about 790 acres. Expected additional oil, 208,505 bbl. Operators expect to ask approval of unit agreement.

. . . **Drill Well Oil Co.,** for a flood in the 500-600-ft. Gunsite sand underlying its Clarida-Johnson lease in Young County Regular field, Young County, North Texas. Ultimate flood plan termed dependent on outcome of current pilot operation. Additional oil from project estimated at about 80 per cent of primary production or about 200,000 bbl.

. . . **Magnolia Petroleum Co.,** for a pilot water flood in the Yates sand underlying its 170-acre George Sealy Section 46 lease in Magnolia-Sealy field, Ward County, West Texas. Additional oil estimated at about 255,000 to 425,000 bbl. Permission sought to extend the one-well project at later date without special hearing (entire reservoir comprises 530 acres).

. . . **Humble Oil & Refining Co.,** for permission to inject gas into the Clearfork formation under its McKean-Eilers lease in Fullerton field, Andrews County, West Texas.

Projects approved . . . The commission approved plans by three firms to conduct secondary-recovery projects. Permits were issued to:

1. Sun Oil Co. to conduct gas-injection operations in the Strawn sand at 6,000 ft. in North Jameson field, Mitchell County. One injection well.

2. Carmack Drilling Co. to begin a water-flood program in the 1,560-ft. Yates sand underlying its leases in Pecos Valley High Gravity field, Pecos County, West Texas. Eight injection wells.

3. Nixon Oil Co. and Kirkwood & Co. to inject air into the 1,500-ft. sand in Cooksey field, Bexar County, Southwest Texas. Three injection wells.

Cambrian Well Completed

BRONTE, Tex.—Bronte field, where first indications of Cambrian production were found, has had its first completion in that pay horizon. The field is located in east-central Coke County, West Texas.

Humble Oil & Refining Co. 5 Keeney in Section 453, a field development location, completed good flowing well, making 414 bbl. of oil through ¼-in. coke in 18 hours. Oil was 52° and pay section was open hole between 5,334-46 ft., total depth. This well was started with the Cambrian as its objective. It is the second Cambrian well in Coke County. The other is in Rawlings field to the north of Bronte field. Other tests in this area have had promises of oil production in the Cambrian but there were no previous completions in that pay.

Interest in the Cambrian as the main objective has spurred further search in Coke County. Field reports carry one new start 4 miles south of Bronte, and another 2 miles south of the same town.

Field Future Debated

Round Top operators split on method of conservation

AUSTIN.—The Texas Railroad Commission last week began deliberations on whether or not to shut in oil production from the Palo Pinto reef of Round Top field in Fisher County, Texas, until all produced gas is conserved and/or additional pressure-maintenance operations are instituted.

Operators' testimony as to why the field should not be shut in was taken by the commission during a show-cause hearing April 14.

All operators were opposed to any shutdown of production, but they split sharply over the need for extending pressure-maintenance operations in the field.

Round Top field has about 134 wells and is essentially developed. Reservoir pressure when the field was discovered early in 1947 was 2,018 psi. It averaged 1,650 psi. on January 1, 1954. Gas injection into the gas cap through one well was begun in July 1952 and another injection well added about a year later. The rate of decline in recent months has slowed considerably.

About 2.38 per cent of produced gas was flared in February 1954. Approximately 52.4 per cent of residue gas from the reservoir was recycled. Operators are selling most of the remaining residue.

Recommendations differ . . . Represented at the hearing were Texas Pacific Coal & Oil Co., W. H. Bryant, Round Top Oil Co., and General Crude Oil Co.

The first three contended that there is no immediate need for an expansion of pressure-maintenance operations—that the reservoir is performing in a favorable manner with no underground or aboveground waste.

M. F. Powell, consulting engineer for Bryant, said the reservoir is benefiting pressurewise from encroaching water and from an expansion of the relatively small gas cap. He said pressure has about reached the level at which it will be maintained with the current injection facilities, and that the commission should not order field-wide injection facilities installed until the effects of the current program can be fully evaluated.

General Crude, represented by Martin G. Miller, Houston consulting engineer, took a different position. Miller contended that increasing gas injection during the past few months was a substantial factor in slowing the decline in reservoir pressure. Miller said he believed, however, that reservoir pressure could not be maintained even if all produced gas were returned to the reservoir. He said his studies indicated that a water-injection program was necessary if the greatest ultimate production of oil from the field were to be realized.

To January 1, Round Top had produced about 9,000,000 bbl. of oil. Miller estimated that original oil in place was about 100,000,000 bbl.

Allowable Process Revised

AUSTIN.—The Texas Railroad Commission has revamped its procedures for assigning allowables to gas wells and is requiring more information from operators.

The new regulation, issued as a memorandum but actually an order, provides penalties for violation of its provisions. One of these is a day's allowable for each day that required reports from the operator are late.

Another penalty accrues when an operator recompletes a well in a new zone and has overproduced in another zone in that well. In this case, the operator must make up for the overproduction from the first reservoir, with the new zone shut in.

This is the first instance where the commission has not kept entirely separate the regulation of reservoirs which are not connected. Previously, they have been treated as two distinct fields, whether the separation was geographical or geological.

Commission Goes Modern

AUSTIN. — Delivery of IBM machinery is being awaited by the Texas Railroad Commission so it can begin the big job of transferring all its records from old-fashioned hand-entry ledgers to machine punch cards.

The commission got appropriations of $240,000 during the 2-year period starting last September 1 to finance the modernization of oil and gas records. Rudy Enck has been named head of a new division which will handle oil and gas machine statistics. Enck is now attending IBM school and working up flow charts so as to be ready to put the procedures into operation when the equipment arrives.

Import Estimates Rise

Reporting companies tell Texas Railroad Commission their April-July estimates should be raised 10,000 bbl. daily

COMPANY estimates of crude imports for the April-July period have been raised about 10,000 bbl. daily but the additional crude will be offset by a reduction in products to be imported.

Companies reporting to the Texas Railroad Commission estimated last month that crude imports for the April-July period would average 631,900 bbl. daily, but in April the estimate was raised to 643,500 bbl. daily. The early forecast of product imports for the 4-month period was 310,500 bbl. daily which was cut to 298,000 bbl. daily by the latest report.

Actual imports of crude by the reporting companies averaged 642,300 bbl. daily for March 1954 compared with 677,400 for March 1953. Product imports were also down to 346,900 bbl. daily from 378,100 bbl. daily last year.

For the month of February, total imports reported to the commission represented 95.4 per cent of the total of actual imports compiled by the Department of Commerce. In other months, the portion of total imports reported has ranged from 90 to 95 per cent. If this ratio holds for the next 4 months, imports can be expected to average a little over 1,000,000 bbl. daily.

Eastern States Petroleum Co. reported receipt of Middle East crude in March representing a daily average of 3,500 bbl. Similar imports are scheduled for each month through August. This crude is reported as 24° gravity or the same gravity as the 102,000-bbl. cargo of Neutral Zone crude imported in February.

Tide Water Associated Oil Co. reported receipt of 137,000 bbl. of Neutral Zone crude in March. None was scheduled for April, but receipts of this crude are expected to average 3,387 bbl. daily in May, 11,032 bbl. daily in June, and 5,000 bbl. daily in July and August.

McBride Oil & Gas Corp. reported that it expects to start importing heavy Mexican crude in May.

IMPORTS*

(Thousands of barrels daily)

	Actual		Estimated or forecast				
	Mar. 1953	Mar. 1954	April 1954	May 1954	June 1954	July 1954	Aug. 1954
CRUDE—EAST COAST:							
The Atlantic Refining Co.	51.1	62.2	65.8	65.8	65.8	65.8	65.8
Cities Service Co.	9.6	8.1	6.8	6.5	10.0	9.7	23.9
Eastern States Pet. Co.	3.2	6.5	4.3	4.3	3.5	3.5	3.5
Gulf Oil Corp.	138.0	105.0	102.0	124.0	120.0	126.0	125.0
McBride Oil and Gas Corp.				4.8	7.5	7.3	7.3
Phillips Petroleum Co.	6.3	6.3	6.7	6.4	6.6	6.4	6.4
Sinclair Oil Corp.	72.3	72.3	66.0	66.0	66.0	66.0	66.0
Socony-Vacuum Oil Co.	103.8	87.5	89.0	89.0	89.0	89.0	89.0
Standard Oil Co. of California	111.2	93.9	72.3	72.3	72.3	72.3	72.3
Standard Oil Co. (Ind.)	9.3	16.1	16.7	19.4	13.9	15.0	16.0
Standard Oil Co. (N. J.)†	91.0	87.0	81.0	81.0	81.0	81.0	81.0
Sun Oil Co.	4.0	7.3	7.5	14.5	15.0	7.2	11.1
The Texas Co.	77.6	52.0	45.8	52.4	53.0	53.0	53.0
Total East Coast	677.4	604.2	563.9	606.4	603.6	602.2	620.3
CRUDE—WEST COAST:							
Standard Oil Co. of California	¶	14.0	21.2	21.2	21.2	21.2	21.2
Tide Water Associated Oil Co.	¶	18.6	8.0	14.2	18.5	10.0	10.0
The Texas Co.	¶	5.5	4.5	21.5	15.2	20.0	20.0
Total West Coast	¶	38.1	33.7	56.9	54.9	51.2	51.2
Total United States	677.4	642.3	597.6	663.3	658.5	653.4	671.5
PRODUCTS:							
Asiatic Petroleum Corp.	7.6	6.2	3.6	4.3	8.0	7.7	7.5
Eastern States Pet. Corp.	8.3	25.8	22.0	22.0	22.0	22.0	22.0
Gulf Oil Corp.	10.0	11.0	6.0	6.0	10.0	9.0	10.0
Shell Caribbean Pet. Co.‖	124.0	109.0	105.0	80.0	80.0	70.0	60.0
Shell Oil Co.	12.4	20.6	25.3	16.2	21.0	13.6	17.0
Socony-Vacuum Oil Co.	6.9	9.6	7.8	7.8	9.4	9.4	9.4
Standard Oil Co. (Ind.)‡	24.1	12.3	20.3	13.2	12.0	11.6	11.6
Standard Oil Co. (N. J.)†	172.0	149.0	133.0	133.0	133.0	125.0	125.0
The Texas Co.	12.8	3.4	3.5	3.4	8.5	8.4	8.4
Total products	378.1	346.9	326.5	285.9	303.9	276.7	270.9
Total crude and products	1,055.5	989.2	924.1	949.2	962.4	930.1	942.4
Bonded oil included§	62.6	49.8	57.6	55.3	59.7	65.4	65.2

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Received through suppliers who can furnish either domestic or foreign oil. §Mostly duty free for bunkering ships in foreign trade. ¶Included with East Coast. ‖Imported by independent distributors.

Imports, Exports Up

Saudi Arabia and Indonesia shipments make up increase

IMPORTS increased about 50,000 bbl. daily and exports gained 25,000 bbl. daily in February, according to data released by the Census Bureau of the Department of Commerce.

Crude imports averaged 630,000 bbl. daily in February compared with 578,000 bbl. daily in January and 582,000 bbl. daily a year ago. Most of the increase was accounted for by larger receipts from Saudi Arabia and Indonesia. The total also included shipments from Ecuador and Trinidad. The crude from Trinidad came to the East Coast, and the cargo from Ecuador was delivered to the West Coast.

Crude imports for the West Coast averaged 74,800 bbl. daily in February compared with 36,700 bbl. daily in January, but the January average was the lowest since February 1953. West Coast receipts averaged about 78,000 bbl. daily for 1953.

Refiners on the Gulf Coast imported 361,743 bbl. of crude in February. In addition to the cargo of crude from the Neutral Zone, receipts were reported from Mexico, Colombia, and Venezuela. About 70 per cent of the total was heavy crude.

The total of product imports in February was practically unchanged from January. The decrease for residual was balanced by gains for distillate, asphalt, and unfinished oils.

Crude exports for the month dropped below 1,000,000 bbl. for the first time in over 20 years. The general downward trend for crude exports has resulted from the loss of European markets to Middle East production and from the decrease in exports to Canada.

Exports of lube oils increased to 46,000 bbl. daily for the highest monthly average since August 1952. Other gains were reported for gasoline, kerosine, and residual fuels.

IMPORTS INTO CONTINENTAL UNITED STATES
(Thousands of barrels)

	Feb. 1954	Jan. 1954	Feb. 1953
Crude—			
Mexico	280	373	558
Colombia	1,193	1,282	1,533
Venezuela	8,662	9,456	8,735
Trinidad	112	.....	.....
Ecuador	90		
Kuwait	2,432	3,125	2,287
Saudi Arabia	2,271	1,946	2,318
Iraq	406	202	187
Qatar	278	178	
Canada	193	232	92
Far East	1,726	1,138	582
Total crude	17,643	17,932	16,292
Daily average	630	578	582
Products—			
Residual fuel	13,520	15,188	12,530
Other products	897	797	884
Total products	14,417	15,985	13,414
Daily average	515	516	479
Total all oils	32,060	33,917	29,706
Daily average	1,145	1,094	1,061

EXPORTS*

	Feb. 1954	Jan. 1954	Feb. 1953
Crude	795	1,588	2,011
Gasoline	2,340	2,074	2,339
Kerosine	609	418	376
Distillate	1,232	1,616	3,546
Residual	1,751	1,355	1,339
Lube oils	2,287	969	643
Other products	716	876	883
Total all oils	8,730	8,896	11,137
Daily average	312	287	398

*Excludes shipments to territories.

MID-CONTINENT

Important Strike Made

WICHITA.—Stanolind Oil & Gas Co. has made perhaps the most significant discovery in Kansas since the opening of the Greenwood gas field.

Stanolind's deep test in South Greenwood gas field has reached a flow of 130 bbl. of oil in 6 hours. The 1 U.S.A. "C" at the south edge of the pool in southwestern Morton County is producing from perforations at 4,210-16 and 4,192-4,200 ft. in Morrow (Basal Pennsylvania).

This area of Morton County presently produces only gas. The county has only one other oil-producing well. Greenwood field, the fastest-growing gas field in the Mid-Continent, has Topeka and Lansing-Kansas City (Pennsylvania) gas production.

The new Morrow oil discovery is one of several in recent months in Hugoton embayment of the Anadarko basin that point to great potentialities of the pre-Permian rocks in the area.

Hugoton Oil Found

Haskell County's first production established

WICHITA.—First oil production has been established in Haskell County in the northeastern sector of vast Hugoton gas field.

Helmerich & Payne are testing shows of Mississippi lime oil at 1 Jones, 11 miles southwest of Beyer pool, another oil pool in the heart of Hugoton gas field. Recovery on a drill-stem test at 5,070-5,100 ft. was 435 ft. of clean, 36°-gravity oil and 180 ft of oil and gas-cut mud. Another drill-stem test in the lower Kansas City lime (Pennsylvanian) got 5 ft. of clean oil, 20 ft. of muddy oil and 50 ft. of oil and gas-cut mud.

CANADA

Refinery Started

Canadian Petrofina plant to be world's most modern

MONTREAL.—Construction is starting on the $20 million Canadian Petrofina, Ltd., refinery here.

The 20,000-bbl. per day plant will incorporate the new combination design, with all process units closely integrated. This will mean savings in fuel and in the erection of much intermediate process storage. The refinery also will be designed with sufficient flexibility to process Middle East and Venezuelan crudes.

The plant will include five different catalytic units and will be the most modern of its kind when completed.

Canadian Kellogg Co., Ltd., has been awarded the contract for most of the processing units and for all off-site facilities. Processing units to be built by Kellogg include a 20,000-bbl. daily atmospheric crude unit, a 10,000-bbl. per day vacuum flashing unit, a 4,000-bbl. daily visbreaking unit for conversion of heavy vacuum bottoms, and a 3,600-bbl. per day reforming unit which will employ the Ultraforming process.

They also will build catalytic polymerization and alkylation units with feed desulfurization facilities, a 2,500-bbl. per day distillate treating unit, and a 6,500-bbl. per day gasoline treating unit.

Lummus Co. has the contract for construction of a Houdriflow catalytic cracking unit which will have a capacity for charging 10,000-bbl. daily of fresh feed plus 6,000-bbl. per day of recycle. The coke burning capacity of the unit will be 10,500 lbs. per hour.

Lummus will also build a 3,000-bbl. per day Hydrodesulfurization unit which will employ the Shell trickle process for treating light and middle distillates.

Dedication Set

Sun to officially open new Sarnia refinery on May 15

SARNIA, Ont.—The new 15,000-bbl. refinery here of Sun Oil Co., Ltd., will be dedicated May 15.

C. D. Howe, Canada's minister of trade and commerce and minister of defense production, will be principal speaker. Attorney-General Dana H. Porter of Ontario will speak in behalf of the province. Joseph N. Pew, Jr., president of the company, also will make an address.

The new refinery, built from the grass roots, incorporates the modern combination concept of refinery design. It includes the combination unit consisting of a crude distillation column, an atmospheric flash tower, a Houdriflow catalytic cracker with associated distillation equipment, a compressor and contactor section, a debutanizer, gasoline and kerosine treating facilities, and gasoline blending equipment. There also is a Houdriformer with associated depropanizer and a butane-butylene flash tower.

The refinery is located on a 196-acre site located on the east bank of the international St. Clair River. Ground was broken in 1952 and the refinery went on stream last November.

The plant brings the total crude capacity of the Sarnia area to 121,015 bbl. per stream day, making it the second largest refining area in Canada. Catalytic Construction of Canada, Ltd., was general contractor. Sun did all process design except on the catalytic portions of the Houdriflow and Houdriformer sections. These were done by Houdry Process Corp.

French Strike Made

What may be Europe's biggest well is brought in by Esso Standard, only foreign company involved in big oil search

A WILDCAT discovery in France last week appeared to be one of the best producers ever drilled in Western Europe.

The 1 Parentis, testing a 4,300,000-acre Esso Standard, S.A.F., concession, flowed at a rate of 2,685 bbl. daily of 33.5°-gravity oil on a ½-in. choke. On a ¾-in. choke, the well had a settled flow rate of 1,100 bbl. daily.

Late last week the French contractor, Forex, had cored well over 100 ft. of pay section and was coring ahead below 7,546 ft., with the cores still showing saturation. The flow tests were made of the interval between 7,415-31 ft. Esso Standard planned to core until hitting water and then to core the aquifer section also.

Gas-oil ratio on the tests was 35 cu. ft. per barrel. Bottom-hole pressure was 3,215 psi. The company had set 9⅝-in. casing at 7,343 ft. The contractor is using a heavy rig, renovated with American equipment some time ago and capable of carrying the hole to 10,000 ft. or deeper. The producing section is in the Lower Cretaceous, but the hole is expected to be carried into Jurassic soon. Location is about 44 miles southwest of Bordeaux.

Importance . . . The strike is significant for two big reasons:

. . . It indicates the first major oil production ever found in France.

Total production in the country at the beginning of this year was about 7,000 bbl. a day, plus about 4,000 bbl. more in French territories. A concentrated exploration program by the government since the war has resulted in only one important find—Lacq field, which has a daily output of about 6,000 bbl. Only other oil production of consequence in France is in the old Pechelbron field, from which production is divided about equally between shallow wells and oil seeps on inclined slopes.

. . . It could well mean that the French will become more receptive to foreign oil investment.

Esso Standard made its discovery with its second well, after years of negligible results by French companies backed up by assistance from the Economic Cooperation Administration. California-Texas Oil Co., Ltd., and Conorada Petroleum Co. negotiated separately for concessions in the Paris basin last year, but both deals fell through because of strict French Government requirements for national ownership.

On the basis of test results, Esso Standard is now planning two offsets to the new discovery.

The company . . . Esso Standard is the only foreign company involved in the extensive exploration program now under way in France.

Standard Oil Co. (N. J.) is principal owner of the company, with a 60 per cent stock ownership. Gulf Oil Corp. and individual shareholders in France own the rest of the stock.

The concession now being explored was granted in 1952 and expires in 1957. The huge grant is roughly centered geographically on Bordeaux.

The concession terms provide that when production is found a producing company be formed in which the French Government will hold a 10 per cent interest.

Rebuilt French Refinery Has 16,000 bbl. Capacity

Smallest of the three refineries operated by Cie. de Raffinage Shell Berre in France is at Pauillac in the Medoc district 14 miles from the mouth of the Gironde River. The refinery has been completely rebuilt since the end of the war and now has a total capacity of 800,000 tons, or about 16,000 bbl. daily. It consists of two Trumble units, one for topping crude from Lacq field in the Pyrenees and South America, and the other for Middle East crude. Facilities also include a small asphalt plant. (A Shell photo).

Red Swap Sours

Egypt will have to rerun initial Romanian kerosine

THE Egyptian Government's arrangements to import products from Russia and its Romanian satellite have soured as a result of inferior quality of the first cargo.

Reports from Cairo are that the initial shipment of 7,200 tons of Romanian kerosine (approximately 56,000 bbl.) will have to be rerun before it can be used.

The kerosine was first received early in April at Alexandria from Constanta, Romania, in the Italian tanker, Recco. The Egyptian Cooperative Society has been scheduled to take the product, but they refused when samples were badly off color, coated lamp chimneys with a soot, and burned wicks to ashes.

The vessel remained at Alexandria with its cargo for 2 days and then Dr. Favek Faltas, the deputy director of the Egyptian Fuels Department, gave it a permit to move through the Suez Canal to Suez. There the kerosine was unloaded at the Egyptian Government's refinery.

The refinery was expected to blend the kerosine in with crude oil for complete rerefining.

Egypt loses saving . . . The trade agree-

ment with Russia calling for exchange of oil products for Egyptian goods, principally cotton, was announced in Cairo the latter part of February. The Egyptian Ministry of Commerce and Industry said Egypt would obtain the oil at prices 16 per cent below world market levels, but it was reported that the cost of reprocessing the initial shipment of kerosine would exceed the savings on this cargo.

Although no news of the difficulties with the cargo was published in Egypt, it appeared the responsibility lay with Egyptian officials who accepted specifications considerably below standard. The kerosine was said to have met contract terms in the most important respects.

It was reported in Cairo that Dr. Mahmoud Abou Zeid, director general of the Fuels Department, had been suspended from his post.

The Egyptian - Russian agreement called for the supply by Russia of a total of about 4,450,000 bbl. of kerosine, gasoline, "solar" oil, and fuel oil. The largest item was kerosine which is a major product in Egypt's consumption pattern. A total of 1,790,000 bbl. of kerosine was to be provided, and of this 1,550,000 bbl. was to come from Russia, and the remaining 240,000 bbl. from Romania.

Active Rigs Hit Record

Rotary rigs running in free world at new all-time high; more expansion expected in exploration and development

Dahl M. Duff

THE volume of exploratory and development work taking place outside the United States now appears to be at an all-time high.

This is indicated in a compilation of available information on the number of rotary rigs running in the different areas of oil interest abroad.

The total in operation in the non-Communist countries outside the United States and Canada exceeds 700. The increase since late last summer is approximately 40.

In addition to this total, in early April there were 2,594 rotary rigs operating in the United States, and another 162 in western Canada. The aggregate number of these drilling outfits throughout the non-Communist world thus approximates 3,460.

Rotary Rigs Outside the United States

(Excluding Communist-Controlled Areas)

Country—	March 1954	August 1953	July 1952
North America:			
Cuba	1		1
Mexico	82	70	80
Total	83	70	80
South America:			
Argentina	45	45	45
Barbados	1	1	
Bolivia	6	3	2
Brazil	8	5	5
Chile	5	5	5
Colombia	23	21	17
Ecuador	9	9	11
Peru	22	18	22
Trinidad	27	27	27
Venezuela	110	117	122
Eastern and Cent.	64	69	60
Western	44	48	62
Total	256	251	256
Western Europe:			
Denmark		3	3
British Isles	6	6	8
France	25	26	31
W. Germany	140	130	95
Italy	30	26	20
Netherlands	6	5	4
Portugal	2	2	2
Spain	2	3	3
Total	211	201	166
Africa:			
Algeria	9	6	5
Angola	1		
Egypt	3	1	2
Ethiopia			1
Madagascar	1	1	1
Mozambique	1	1	
Fr. Equatorial Africa	3	3	2
French Morocco	9	6	5
Nigeria	4	3	1
Tunisia	8	6	6
Total	39	27	23
Middle East and Eastern Mediterranean:			
Bahrein	2	2	2
Greece	1		
Iran	1	2	2
Iraq	13	13	11
Israel	1		
Kuwait	3	5	4
Lebanon			
Neutral Zone	2	1	
Trucial Coast	1	1	1
Qatar	2	2	3
Saudi Arabia	7	11	9
Syria			
Turkey	2	2	2
Total	35	39	34
Other Asia:			
Australia	4	3	2
Burma	2	2	2
Indonesia and British Borneo	42	41	41
India	6	6	4
New Caledonia	1		
Pakistan	5	5	5
Japan	15	15	13
New Guinea	4	4	5
Total	79	76	72
Grand Total	703	664	632

Activity increases . . . Increased activity is reported in a number of foreign areas. Nearly 150 rigs of all kinds are in operation in West Germany in an intensive drilling and development program. Though per well production is often relatively small, total West German output has been rising steadily for the last 5 or 6 years and now approaches 50,000 bbl. daily.

The state-supported exploration program in France employs some 25 rigs, and in addition, French companies are engaged in widespread drilling in other parts of the French Union, including Algeria, Tunisia, French Equatorial Africa, Morocco, and Madagascar. Much of the work taking place in Italy continues to aim at further natural-gas production, but these rigs are augmented by foreign-company work in Sicily.

In Peru, Colombia, and Bolivia rigs have been added to the drilling effort under way in those countries. Five or six additional rigs are working in Peru on acreage taken under the 1952 Peruvian law or by contract deals with other operators.

The upturn in drilling in Mexico reflects the improved situation in that country since the slump last year during the decline in export sales of Mexican heavy oil. Work has been resumed in some of these areas, and in addition, Petroleos Mexicanos is broadening its over-all exploratory program. In Venezuela, there has been some decline in drilling in the heavy-oil fields in the western part of the country. This has been partially offset by increased activity aimed at finding more lighter crude in the eastern section.

In the normal fluctuation of industry activity abroad, exploratory programs discontinued in different areas are succeeded by others initiated elsewhere. Net change in this type of work is in the direction of considerably greater activity. Although crude oil is in more than comfortable supply and world reserves are at record levels, oil companies appear to be increasing their activity abroad. Larger operators recognize the need to diversify crude resources, while smaller United States companies are attracted by the opportunity to take large

blocks of wildcat acreage in foreign operating.

Expansion to continue . . . The prospects are for a continued expansion of drilling abroad. Several countries are opening up, such as Turkey and Tripoli. In addition, there are numerous small exploratory ventures under way which are as yet in the early stages of geological and geophysical investigation. Actual drilling is still to come in many of these areas.

Among these are Costa Rica, British Honduras, offshore in Trinidad, the Peruvian Montana, western Ecuador (where Standard Oil Co. of California has taken acreage), southern Algeria, British Somaliland, western Egypt, Israel, Australia, and India's Bengal Basin.

Iranian Progress Made

Reports indicate tentative agreement reached in Teheran negotiations on major points involved in oil discussions

PROGRESS appears to have been made thus far in negotiations in Teheran toward a settlement of the Iranian oil nationalization problem.

No official information was available on the status of the discussions, but it was indicated that tentative agreement had been reached on a number of major points.

By the middle of last week, the talks had moved over to the subject of compensation to be paid Anglo-Iranian Oil Co., Ltd. In Teheran, a parliamentary source said Anglo-Iranian's bill for its properties amounted to more than half a billion dollars.

Certain phases of the compensation were being discussed in entirely separate negotiations in Teheran between Iranian officials and a wholly British delegation. These discussions apparently were concerned mainly with losses sustained by Anglo-Iranian during the last 30 months as a result of nationalization.

Counterclaims . . . Offsetting this, however, will be the Iranian bill for its own counterclaims. Iran has raised huge claims against Anglo-Iranian, including damages for losses during an alleged oil embargo since the nationalization. The negotiators were about to consider Iran's counterclaims.

It was reported that the total amount of compensation was provisionally agreed upon in London by the consortium before its representatives left for Teheran. The final decision depends on Iran's acceptance of certain terms relating to oil prices, quantities, and operational control.

The anonymous Iranian source said the negotiators were considering a contract running between 20 and 30 years, and that practical control of the fields and refinery would be in the hands of the consortium. All sales of Iranian oil would be made through the consortium, and the 50-50 principle would govern the revenue division. It was said that the consortium wants to pay Iran in sterling, but the Iranians were unwilling to be drawn completely into the sterling bloc.

The negotiations are taking place between a delegation representing the eight-company consortium recently organized in London, and officials of the Iranian Government. It was predicted that the talks would continue 3 more weeks, or probably through the first week of May.

Peron Opens Door

President repeats overture to foreign oil companies

NEW evidence that the Argentine Government is prepared to offer further inducements to foreign oil companies was given last week by President Juan Peron personally.

In a political address in Buenos Aires, General Peron declared that his government was ready to contract with foreign companies to develop and produce oil in Argentina. At the same time he vigorously defended this course of action against criticism from ultra-Nationalists.

He accused the opposition Radical Party of responsibility for the inadequate development of the Argentine oil industry, a situation which he said resulted in oil shortages in World War II.

The world is now facing a third great war, he said, and to avoid another difficulty with oil supply, Argentina must attain petroleum self-sufficiency in the shortest possible time. The foreign companies to be hired would be paid for their work, "and a little bit more," General Peron said. He said it is necessary for Argentina to produce 100 per cent of its requirements to save the $300,000,000 annually now spent on oil imports.

Speaks for political reason . . . General Peron's 2-hour and 20-minute broadcast speech was a refutation of Radical charges that he was selling out the nation's sovereignity by a new oil policy.

"The Radicals say we have to conserve our resources . . .," he said. "What is the use of keeping these reserves when maybe in 20 years atomic energy will supplant petroleum in 80 per cent of its uses?"

The address obviously was designed for maximum political effect. Early this week Argentina was scheduled to elect a vice president and about half the members of a new congress.

The possibility that Argentina might ease its restrictive measures against entry of foreign oil companies first arose last summer with passage of a law to encourage new foreign investment. Government officials spoke of welcoming any proposals from foreign companies.

However, the larger companies in the business generally shunned these overtures. For one thing, Argentina has a long record of antagonism to foreign investment, including oil.

Furthermore, it appeared the most Argentine officials were willing to offer was drilling deals, or percentage-of-production contracts, along the Mexican pattern.

Observers believe it will take considerably more incentives on Argentina's part before the country can attract any substantial amount of risk capital in the oil business.

Prospecting Rights Asked

West Australian Petroleum, Pty., Ltd. has asked the Mines Department of the West Australian Government in Perth for prospecting licenses on 9 areas in the Kimberley district and 10 areas in the coastal district between Exmouth Gulf and Carnarvon.

The licenses would allow the company to carry out drilling operations on the 200-sq.-mile areas. West Australian Petroleum, an 80 per cent Caltex-owned company, holds exploration permits over some 340,000 square miles of West Australia. These permits come up for renewal in October, and the company is expected to turn back some of the acreage at that time.

The areas covered by the prospecting licenses include locations where the company plans drilling this year. Its drilling program, which will involve the use of four rigs, provides for a wildcat test of the Kimberley district, one of the Cape Range structure and development drilling near the discovery it made last November at Rough Range.

PERSONALS

After 44 Years' Service . . .

Harden Again at Work in Iran

ORVILLE HARDEN, who heads up the team now attempting to work out an Iranian oil settlement in Teheran, has for many years been one of the least-known but most influential men in the American petroleum industry.

During 25 years as a director and later a vice president of Standard Oil Co. (N.J.), Harden figured prominently in the succession of top-level transactions that raised this company to its present commanding position in the business.

Whatever thoughts Harden may have had last fall about a leisurely retirement were shattered when he was suddenly thrust in the midst of the new Iranian negotiations. He ended a 44-year association with the Jersey company when he retired January 1, but he remained on special assignment to represent the company in the recent London discussions leading up to the formation of the eight-company international consortium.

In mid-April Harden arrived in Teheran as head of the consortium's negotiating team. In these meetings he faces on the other side one of his oldest friends, Torkild (Cap) Rieber, Barber Oil Co. president who is acting as adviser to the Iranians. If an agreement is eventually hammered out in Teheran, reports are that Harden may take a top post in the new organization.

Quiet, efficient . . . Harden is a tough, keen negotiator who goes to the conference table thoroughly briefed. He makes no speeches, shuns publicity, and often works quietly in the background. He has masterminded the solution to some of the toughest and biggest transactions in the industry since the mid-30's, most of them dealing with foreign oil operations.

In Teheran, Harden is involved in somewhat different type of negotiations. While the subject is still oil, he is dealing with political officials instead of practical and realistic business men.

In all his long career with Jersey Standard, Harden has never worked in either a refinery or an oil field. In September 1910, he went to work in the old Standard Oil Co. as an office boy for George McKnight, then secretary of the manufacturing committee.

The record of his rise shows the following: 1911, junior clerk; 1917, assistant to McKnight; 1921, secretary of manufacturing committee at the age of 27; 1925, member of the manufacturing committee; September 1925, head of the newly formed coordination department, established to supervise all operations; 1929, director; 1935, vice president; and 1937, vice chairman of the executive committee.

When Harden joined the board at the age of 35, he was the youngest man ever elected to the post. That same year, he took part in his first important negotiation, the purchase of the remaining 50 per cent of Refiners Oil Co. and the resulting acquisition of an interest in Ajax Pipe Line.

Other major negotiations in which Harden was a principal figure included: arrangements with Anglo-Iranian in 1930 for a long-term crude supply; the formation, with Socony-Vacuum Oil Co., Inc., in 1932 of Standard-Vacuum Oil Co.; purchase of the foreign properties of Standard Oil Co. (Ind.); renegotiation of the Iraq petroleum agreement in 1947 which abolished the Red Line feature; and arrangements with Anglo-Iranian for a 20-year crude supply and the Middle East Pipe Line plan, which made possible the Jersey purchase into Arabian American Oil Co.

Harden was the last of the Jersey Standard directors who had come on the board in the 1920's, and his retirement in a sense removed the board's final link with an older generation of oil men.

W. V. Roberts has joined **Darrell W. Smith,** Midland drilling contractor, as contact man and safety supervisor.

Albert I. Ingham, formerly chief geologist, has been appointed to Peoples Natural Gas Co.'s new position of superintendent of land and geology.

Bernard A. Taylor has been transferred by Sohio Petroleum Co. from Houston to Casper, Wyo., as district geologist.

William H. Geddes, estimating engineer for Pure Oil Co., has been transferred from the firm's refinery at Cabin Creek, W. Va., to its refinery at Toledo.

A. J. Lowrey, Union Oil Co. of California vice president in San Francisco, has been elected to the firm's board of directors, replacing **W. W. Valentine,** who has resigned. **E. L. Hiatt,** manager of transportation and distribution, also has been elected a vice president.

F. A. Gruver has been named superintendent of Stanolind Oil & Gas Co.'s new production district, headquartered in Casper, Wyo. It will cover producing operations in most of Colorado, western Nebraska, Utah, Idaho, South Dakota, and most of Wyoming. Gruver formerly was field superintendent at Rangely, Colo. **M. O. Hegglund,** formerly senior petroleum engineer in the firm's Rocky Mountain division office in Casper, has been named district engineer. **V. N. Adams** also has been named to supervise producing operations in the new Kimball, Neb., area. **H. L. Howard** has been placed in charge of the new area office at Dickinson, N. D.

Fred Powell has been appointed assistant general manager of Standard Oil Co. of California's manufacturing department, with responsibility for coordinating chemical manufacturing activities. Powell, with the firm since 1925, previously headed the subsidiary, California Research & Development Co., which has been dissolved following completion of its assignment for the Atomic Energy Commission. He has held posts in company refineries at Richmond, El Segundo, and Bakersfield, Calif., and refineries of subsidiaries located in El Paso, Tex., and Perth Amboy, N. J. In 1948, Powell was general manager of the El Segundo plant before his appointment in 1950 as president of California Research.

PERSONALS

Robert S. Matthews, formerly production engineer at St. Elmo, Ill., for Carter Oil Co., has joined Mid-Continent Petroleum Corp. as research engineer at Tulsa.

W. S. Hill has been promoted by Union Producing Co. from district petroleum engineer at Houston to field drilling and production superintendent at Houma, La.

W. H. McBrayer has retired after 30 years with Sinclair Pipe Line Co., Independence, Kans., and its predecessor companies. On January 1, 1951, he was elected counsel of Sinclair Pipe Line and held that post until July 1953 when he was elevated to assistant to the president in the executive department. He held that post until his retirement.

Alvin R. Winzeler has been promoted by Stanolind Oil & Gas Co. to exploration superintendent of the firm's Canadian division, headquartered in Calgary, Alta. **Robert O. Mitchell** succeeds Winzeler as division geologist. **C. O. Hopper, Jr.,** also have been advanced from field superintendent to the newly created post of district superintendent for producing operations. **Clifford F. Rakestraw,** formerly farm boss in the Rangely, Colo., area, has been placed in charge of Stanolind's new area office in Edmonton, Alta. **H. W. Hinkle, Jr.,** has been named field engineer for the Edmonton area. **Andrew F. Holan,** junior petroleum engineer, and **John B. Maughan,** petroleum engineer, have been assigned to Edmonton and Calgary, respectively.

Joe Christesson, formerly superintendent at Casper, Wyo., for R. L. Manning Co., has joined Arapahoe Drilling Co. as drilling superintendent at Brush, Colo.

Elmer T. Ireton, formerly with Stanolind Oil & Gas Co. at its district office in Shreveport, La., has joined Texas Crude Oil Co. in Fort Worth as chief engineer.

R. H. Martin has been advanced by The Texas Co. from district geologist at Midland, Tex., to Houston as an executive staff geologist.

L. W. Goodrich, formerly with The Texas Co., has joined San Jacinto Petroleum Corp. as production superintendent in Houston.

Penn L. Gooldy has resigned as district geologist in Casper, Wyo., for Union Oil Co. of California to become associated with **Horace Goodell** as consulting geologists in Lakewood, Colo.

L. A. Toone, formerly manager of Concesionaria de Petroleum Shell-Condor, the main operating company for Royal Dutch-Shell in Colombia, has been transferred to the New York office of Asiatic Petroleum Corp.

Past Presidents Attend Annual A.A.P.G. Meeting

Eleven past presidents of the American Association of Petroleum Geologists were present at the recent annual meeting of the association in St. Louis. Left to right are: front row, R. K. Dennison, 1943; E. DeGolyer, 1925; Wallace Pratt, 1920; Alexander Deussen, 1918; Clarence Moody, 1950; C. W. Tomlinson, 1949; back row, W. B. Heroy, 1934; C. E. Dobbin, 1947; Morgan J. Davis, 1952; Edward C. Owen, 1941; and Dr. Frederic C. Lahee, 1932.

Dr. Kenneth A. West has been promoted by Canadian Oil Companies, Ltd., from production superintendent at the firm's refinery at Sarnia, Ont., to assistant manager of manufacturing. His main assignment will be research and development projects in the manufacturing department.

George F. Getty, II, has been elected to the board of directors of Pacific Western Oil Corp. He also is vice president and director of Spartan Aircraft Co., and a director of Skelly Oil Co. and Mission Corp.

T. F. Stipp, U. S. Geological Survey, Roswell, will be installed as president of the New Mexico Geological Society during its eighth annual meeting in Albuquerque, April 30 and May 1. Other new officers to be installed, all of Roswell, are **Phil D. Helmig,** Malco Refineries, Inc., vice president; **Roy F. Milks,** Magnolia Petroleum Co., secretary; and **Fred S. Reid,** Lion Oil Co., treasurer.

C. J. Kerwin has been made superintendent of production by Sunray Oil Corp., and **John H. Douma** has been named manager of engineering for the production department. Kerwin and Douma formerly shared responsibility as superintendent of production. Kerwin had charge of West Texas and north-central district operations. Douma controlled operations in the Arkansas, Louisiana, and Gulf Coast district. In the new alignment within Sunray's engineering division of the production department, **Dr. C. W. Ziemer** will be chief reservoir engineer and **M. S. Patton, Jr.,** will be chief development engineer.

W. A. Watson has been promoted by Humble Oil & Refining Co. from assistant superintendent of the Snyder, Tex., district to district superintendent at Pampa. Other recent changes in Humble's production department include **C. C. McNeil,** assistant district superintendent, transferred from Means district to Talco district; **G. E. Ford,** farm boss, Athens district, promoted to assistant superintendent, Means district; **E. H. Gallencamp,** district civil engineer, Stratton district, promoted to senior civil engineer, gas construction

PERSONALS

division, Houston; and **J. H. Pittman,** senior civil engineer, gas construction division, Houston, transferred to Gulf Coast division, Houston, as civil engineer.

John B. Ross has been promoted by The Texas Co. from petroleum engineer at New Orleans to engineer for the Kansas district of the firm's production department, with headquarters at Wichita.

Forrest O. Koontz, Oil City, Pa., has been elected president and a director of Quaker State Oil Refining Co. of Canada, Ltd., a subsidiary of Quaker State Oil Refining Corp. of which he also is a director. **L. R. Forker** and **C. G. Johnson** also have been named directors and vice president and secretary and treasurer, respectively.

Dr. Jose Martorano B., with Shell management in Caracas, has been elected president of the board of directors of the Venezuelan Association of Geology, Mining, and Petroleum. Other officers are: **Dr. V. D. Winkler,** first vice president; **Dr. J. W. Butler, Jr.,** second vice president; **W. H. Chappell,** secretary-treasurer; and **K. Dalmus, Dr. H. N. Henz, Dr. A. Schwarck, Dr. H. Alberding,** and **W. C. Merrett,** counselors.

M. T. McCants has been appointed plant manager for the new refinery to be constructed by Great Northern Oil Co. at Pine Bend, Minn. Since 1951 he has been general plant superintendent at Corpus Christi for Great Southern Chemical Corp. McCants will be in charge of the construction of the 20,000-bbl. per day refinery scheduled to be completed late in 1955. His headquarters will be in St. Paul until offices are completed at Pine Bend.

Irving E. Chapman has been named to replace **Edward P. McCall** as vice president and director of Mitsubishi Oil Co., Ltd., with headquarters in Tokyo, Japan. McCall will return to Tide Water Associated Oil Co. in the United States. He has been on assignment in the Philippines and Japan since 1948. Chapman joined Tide Water in 1928 and for several years has been assistant manager of operations of the firm's western sales division. Tide Water has a 50 per cent interest in Mitsubishi Oil, which owns and operates a refinery in Japan and is one of the principal distributors and marketers of petroleum products in that country.

Lee S. Miller, petroleum geologist, will retire May 1 after 15 years as reservoir and proration engineer with the Michigan Geological Survey. He plans to open consulting offices in Lansing, Mich. Since 1947 he has been engineer and secretary of the Michigan Oil Advisory Board, which operates state laws controlling drilling and production. Miller, a veteran of 35 years in the oil industry, also is a member of the engineering committee of the Interstate Oil Compact Commission.

C. E. (Chuck) Ingram, division office manager for Shell Oil Co. at Corpus Christi for the past 2½ years, has been promoted to district foreman at Devine, Tex., effective May 1. He will be succeeded by **W. D. Langridge.**

John G. McLean, professor of business administration at Harvard University and coauthor of a recent book, "The Growth of Integrated Oil Companies," *(The Oil and Gas Journal, February 15, page 97)* will be an assistant to the president of Continental Oil Co. while on leave of absence from Harvard. He will make his headquarters in Houston and will conduct special studies concerning the company's programs, policies, and procedure.

Richard A. Grant, vice president, general counsel, and a director of Fullerton Oil Co., has been elected to a second term as president of the Oil Producers Agency of California. **R. R. Von Hagen,** president of Lloyd Corp., and **S. E. Cavanaugh,** vice president of Pacific Western Oil Corp., have been elected a vice president and secretary-treasurer, respectively. Reelected officers include: **H. D. Campbell,** president of Franco Western Oil Co., and **W. H. Geis,** consultant, vice presidents; **Stark Fox,** executive vice president; and **Verne Harrell,** vice president of Bankline Oil Co., assistant secretary-treasurer. Directors elected for a 3-year term include: **Jack M. Feldman,** Golden Bear Oil Co.; **Robert H. Garrison,** Hellman estate interests; **James H. Lewis,** independent operator; **M. A. Machris,** independent operator; **N. A. Rousselot,** Standard Oil Co. of Delaware; **L. W. Saunders,** Intex Oil Co.; **Leland K. Whittier,** Belridge Oil Co.; **C. T. Wilson,** The Petroleum Co.; **H. E. Woodworth,** Safe Oil Co.; **R. W. Young,** Roy W. Young, Inc.; and **Cavanaugh** and **Von Hagen.**

Robert L. Walker has been promoted by Shell Oil Co. from drilling engineer at Houston to area drilling engineer at Denver.

Thomas O. Glenn, Jr., consulting petroleum engineer, Titusville, Pa., has been appointed resident engineer in charge of engineering and geology for Lee Oil Co., Leeco, Ky.

Robert W. Hines has resigned as engineer for Stanolind Oil & Gas Co. to join Texas Pacific Coal & Oil Co., Fort Worth, as assistant manager of production.

DEATHS

Fred Swanton Davis, 67, formerly a chief engineer for the marine department of The Texas Co. before retirement, died in Port Arthur, Tex., April 18.

Chester Chapin Lowe, 72, who was retired from Standard Oil Co. (N.J.) 10 years ago, died recently in Doctors Hospital, Washington, after a brief illness.

Donald W. Bell, 68, petroleum specialist of the Tariff Commission since 1930, died April 18 at his home in Alexandria, Va. From 1914 until he joined the Tariff Commission he was secretary-treasurer of Tidal Oil Co., Tulsa.

Norman Morrow, 83, veteran independent producer in eastern Kansas, died recently in Moline, Kans., after a long illness.

Horace Catlett Hume, 59, Owensboro, Ky., general manager of Hupp & Hume, drilling contractors and operators in western Kentucky, died April 14 in Rochester, Minn.

Albert Rush, 78, died recently in Waynesburg, Pa. He was an early drilling contractor in Pennsylvania, Illinois and Texas.

Charles L. Williams, 66, died recently in Wichita, Kans. He was a former assistant attorney general in Oklahoma and was an attorney for Marland Oil Co., Ponca City, Okla., and Cities Service Oil Co., Bartlesville, Okla.

Field Processing...

a special section

Fractionator Instrumentation . . .

Some of the toughest problems in process-plant operations arise when dealing with the fractionation section. Trouble-free operation can be achieved only by paying close attention to selection of the control system. There are many pitfalls which must be avoided when instrumenting the fractionating column. This Journal-Guide on fractionator control answers numerous questions that come up on control of feed rate, products removal rate, heat supply, and column pressure. Examples are included for instrumentation of a gasoline stabilizer, a depropanizer-debutanizer system, and a four-column fractionator train, in the natural-gasoline or cycling plant.

Forum on Tray Design . . .

Here are eight papers taken from the C.N.G.A.-N.G.A.A. fractionator-absorber tray forums. These cover design and performance of conventional bubble-cap trays, and of perforated trays and other liquid-vapor contacting devices recently developed and applied in commercial practice. Emphasis has been on getting more out of the fractionator and absorber. Columns have been pushed for maximum throughput. Fractionators must make more high-purity products than ever before. Newer designs call for high plate efficiencies. Current developments have been rounded up in a second special Journal section which brings together contributions of different companies and individuals.

More on Field Processing . . .

Do's and don'ts for the designer and operator of amine units for H_2S removal are detailed by engineers of one company with operating experience on five M.E.A. units. Operating costs are given. Sulfur-recovery plants are dealt with in another article. How the composition and available quantity of the feed gas influence the economics is told from experience with two commercial installations and an earlier experimental venture. Some possibilities inherent in latent cooling of compressors, including generation of steam, and comparisons with conventional cooling are detailed in still another article of interest to field-processing engineers.

. . . And Results of Annual Field Processing Survey

The Journal's field processing survey, following the trend of the whole petroleum industry, has been expanded in 1954. Data are reported on 493 plants including natural-gasoline and cycling operations. The survey shows the total amount of gas processed daily, the number of gallons of natural gasoline produced, the number of gallons of L.P.G. produced, and whether the plant carries on a gas-injection program. In addition to plants already on stream, the survey lists new plants that are being built and shows the areas where most of the construction is planned or under way. Daily production in the United States averaged 33 million gallons during 1953.

FRACTIONATOR CONTROL

How to Instrument the

FRACTIONATION SECTION

. . . in Field Processing Plants

1. Control of Fractionating Columns.
   - Feed rate.
   - Removing products.
   - How about heat supply?
   - Finding the flood point.
   - Pressure control.
2. Gasoline Stabilizer Control.
3. A Depropanizer-Debutanizer System.
4. Natural-Gasoline-Fractionation Section

THIS special Journal section is for the engineer and operator of the natural-gasoline and cycling plant. It outlines in question-and-answer form some of the basic ideas involved in instrumenting the fractionation section.

Why the fractionation section? . . . What about the rest of the plant? . . . One could deal with the inlet gas system, compressor control, alarm and emergency shutdown system, gas-treating, or other sections of the plant. However, some of the most difficult control problems occur when dealing with fractionators. Therefore it has been decided to concentrate here on instrumentation of the fractionation section.

Also in approaching this business of fractionator control one finds there are different methods for control of temperature and pressure. This is apt to lead to confusion unless the process engineer carefully documents in his own mind which method belongs where. It is true that sometimes alternate methods may do a given job about equally well and the choice might boil down to one of personal preference. To this extent, then, the subject of fractionator control could be a controversial one.

However, in most instances, a given method is applicable only under specific conditions. In the final analysis, the choice of automatic control for a particular column depends on the job the column must do and the design of the column and its auxiliaries.

In this light many basic questions then arise both as to the process and the instruments: What to control? . . . and how close a control? . . . if temperature is the key control, where should the temperature measuring element be located? . . . what method of pressure control should be used? . . . is a proportional controller good enough? . . . or should a proportional-plus-reset be used? . . . what proportional band should be used? . . . what about the control valves?

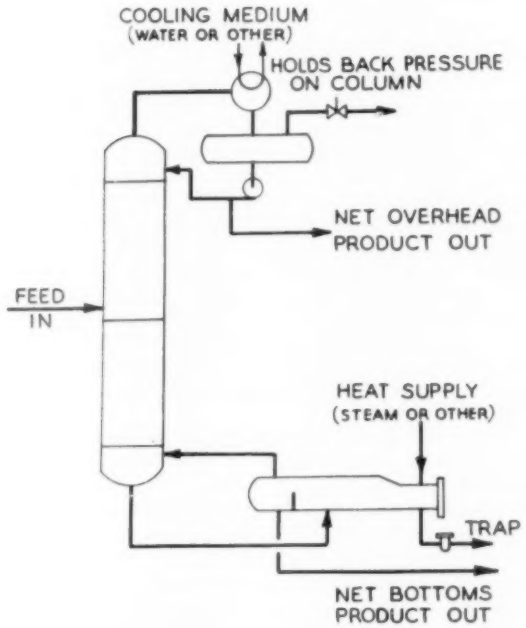
There is no intention of going into the subject of control valves or controller selection at this time. However, in answering some of the questions, suitability of a particular mode of control for a given application will be noted. In dealing with instrumentation of a gasoline stabilizer, some of the factors involved in selecting the control valves will be summarized.

1. Control of Fractionator Columns

Referring to Fig. 1, the vapor furnished by the reboiler and flowing up the column becomes increasingly lighter (greater concentration of lower-boiling components) after each contact with liquid on the trays. The liquid downflow furnished by the reflux becomes increasingly heavier after each contact. This is reflected as a temperature gradient between the bottom and the top of the column. On each plate there is an exchange of heat and material. The liquid and vapor leaving each tray have a different bubble and dew point, each tray temperature being successively lower as we go up the column.

A special section by John C. Reidel, of the Journal staff

1. Stable control is a must . . .



● **Temperature and pressure . . .** Tower operating conditions are determined by the composition of the feed and the specifications set for the products. Thus, with composition of the overhead product specified, we can determine the dew point of the overhead and the tower-top temperature. The top temperature will be higher than the temperature in the reflux drum, how much higher depending on the service (i. e., whether dealing with a deisobutanizer, for example, or with a gasoline stabilizer). The top temperature is dependent on the temperature of the cooling medium.

In some cases, where water is very scarce, forced-air cooling might be employed for at least some of the units. In certain other cases refrigeration might be employed, resulting in lower tower operating pressure than is possible with water cooling.

Ordinarily, however, water is the condenser cooling medium. The water temperature then determines tower-top temperature and the vapor pressure of the overhead product at reflux drum temperature will determine the operating pressure.

With the desired composition of the bottoms product specified, the reboiler temperature is fixed. This is the temperature of the particular bottoms composition whose vapor pressure is equal to the bottom operating pressure. Allowance is made in column design for pressure drop between bottom and top of column, and for the drop between the top of the tower and the accumulator.

● **Tower gradient . . .** What is most important, however, is the temperature gradient of the tower, and the composition gradient that goes along with it. By keeping this temperature-composition gradient in mind, the effect of increasing or decreasing the heat supply to the reboiler or of changing the reflux rate can be better appreciated.

Assume that the tower of Fig. 1 is a deisobutanizer operating on a feed with an average composition of around 90 per cent n-butane and heavier, about 8 per cent i-butane, and the rest propane. Assume that the job the column has to do is to make an overhead product with minimum of n-butane and with retention of i-butane in bottoms held to not over say 0.1 per cent.

How well we can meet these specifications will depend, over-all, on how well we can maintain the maximum temperature gradient between the bottom and top of the column. In this particular case the maximum spread available to us will be say around 20° F. If we were to operate at a considerably lower gradient, say at only 15° F., we would be making off-specification product with a lot more n-butane in overhead and i-butane in bottoms than can be tolerated.

If the reboiler temperature went up while the reflux rate remained the same we would have a smaller temperature gradient and more of the heavier material would go up the column with a greater concentration of n-butane showing up in the overhead. But too low a bottom temperature would be no good either since this would result in insufficient stripping and more light material would be condensed and come out in the bottoms.

Now if the reflux ratio were increased while everything else were kept equal we would have more rectification. The top trays would be cooled more and we would get more condensation of heavier material over this section, resulting in greater concentration of i-butane in the overhead.

So the column must be run with heat supply set to give the necessary stripping and with the reflux rate to match to give the maximum temperature gradient between top and bottom. However, precautions must be taken that the tower does not get flooded. For example, if we are operating close to maximum column capacity and we permit surges in the reflux such that the maximum is exceeded at times, there may be flooding of the upper trays of the column with impaired fractionation.

● **What to control? . . .**

Q. What is the over-all problem of fractionator control? What are we trying to do and what must we control?

A. Our over-all problem is to keep the column operating at equilibrium conditions. In operator's language we want the column just "perking" along, making specification product. On startup it usually takes some hours for the column to attain steady operation. Once it is at equilibrium our aim is to keep it there.

Now there are a number of things that may happen which tend to upset the operation. For example, the steam header pressure may change which would tend to upset the flow of steam to the reboiler. While feed rate and composition would ordinarily remain quite constant for long periods in natural-gasoline processing, these also might change at one time or another.

A good operator, if he were running the column

manually, would not try to counteract these changes by too sudden or violent action. If heat supply to the column decreased, for example, he would open up the steam valve gradually, just a little at a time to correct the condition. Similarly, the instrumentation must be designed to make smooth gradual adjustments when necessary in heat supply, feed rate or reflux, or in rate of product removal.

Accordingly, fractionator instrumentation methods could be classified on the basis of controlling:

1. Feed rate.
2. Rate at which products are removed.
3. Heat supply rate.
4. Condenser cooling medium rate.
5. Column pressure.

A breakdown of control methods in this manner might, however, be somewhat confusing in that feed rate can be and sometimes is tied in with the rate of withdrawal of products, while pressure control may be tied in with flow of condenser cooling medium. Another approach that has been used is to speak of (1) a "material-balance" control system, (2) "rectifying-section temperature" control, (3) "stripping-section temperature" control, and (4) "fractionator-pressure" control.

Another important consideration is column flexibility. Some columns are designed for product flexibility and can make a range of products of different specifications. Often we are also faced with the problem of designing for flexibility with regard to capacity. In natural-gasoline processing, for instance, there is a definite need for such flexibility to provide seasonal variations in plant capacity.

In periods of high-capacity operation it is possible that the column may be crowded beyond its maximum throughput rate so that flooding occurs. For this reason, there is some trend at present toward the use of differential pressure recorders for determination of the flood point so that the column can be operated at the highest throughput rate possible short of flooding.

Q. It is realized that automatic controls of pressure, temperature, and flow are necessary to prevent column upsets and keep the product on specification. But to prevent contamination of the product, how close must the control be, for example, on temperature?

A. That depends on what you are trying to do. It depends on the kind of split you are trying to make. Temperature control on a butane splitter is an example of a more exacting fractionator control requiring that temperature be held to relatively small variations. Exactly how close the temperature must be held would depend to some extent on the feed to the deisobutanizer, that is how much normal and isobutane (and propane carried over) are in the feed, and particularly on how pure an isobutane will be taken overhead and what retention of isobutane is to be permitted in bottoms.

On the other hand, it must be remembered that we must have enough temperature change to actuate the controller and so must locate the temperature-measuring element at some point in the tower where there is a sufficient change in temperature, between one tray and the next, relative to a small change in the composition of the product.

By comparison we have a different, and in many respects easier, instrumentation job to do in the control say of a distillate stabilizer in a gas-condensate processing plant.

Q. Would you say then that temperature control is the most important item in fractionator instrumentation?

A. It is hard to say, in general, what is most important. Again, it depends on the given situation. Temperature may, in many cases, be the most difficult item to control due to the relatively greater lag associated with temperature systems. Heat-transfer lag, capacity lag, and velocity-distance lag, and perhaps even some measurement lag must be overcome in fractionator-temperature control. This should be remembered in particular when instrumenting for a close separation. But in concentrating on temperature one must not forget that pressure control is important also due to its effect on temperature. Again, undue variations in feed rate and composition or in rate of product removal resulting in off-specification product cannot be tolerated either.

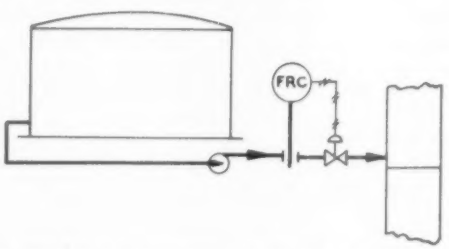
One can operate a fractionating column with very close temperature control yet have off-specification product because heat supply rate or reflux rate are varied too much in order to hold a constant temperature.

● **Feed rate . . .**

Q. Since feed rate is also important, is it ordinarily necessary to use cascade control to regulate the feed rate?

A. Cascade (also known as "pneumatic set" or "interlocked") system would not be necessary ordinarily if the feed comes from storage or from a large feed drum. The arrangement of Fig. 2 would be used.

2. If feed tank is large . . .



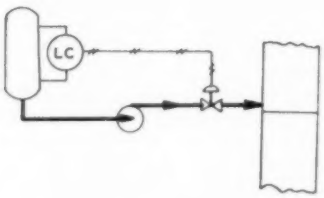
Q. Would a proportional controller be suitable in this application?

A. Yes. Assuming a large enough feed drum (and that no other units are drawing simultaneously at varying rates from this feed tank) a proportional controller would do the job. You could use a relatively high sensitivity (narrow proportional band). However, consider also carefully the use of a proportional-plus-reset instrument, particularly when there is possibility of load changes on the feed side.

Q. Suppose now that we are feeding the intermediate column of a fractionation train, where the feed tank is the accumulator drum of the preceding column . . . ?

A. That would be a level control, as in Fig. 3 . . .

3. Feed is from accumulator . . .



Q. Is a constant level held in the accumulator drum?

A. No, we would use an averaging-type liquid-level control. No attempt is made to hold a fixed level but it is allowed to vary above and below some middle position **within limits.** The control valve in the feed line will open or close in accordance with the rise or fall of the level above or below the set point. The whole idea is not to permit any sudden or large change in the flow to the accumulator to be passed on to the flow **from** the accumulator.

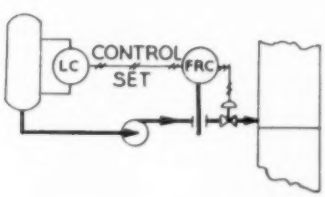
In other words, we make use of the surge capacity of the accumulator drum by using a wide proportional band or throttling range. With a band of around 100 per cent we can get a small change in valve opening for a large change in liquid level. The system of Fig. 3 then operates on a definite relationship between change in liquid level and change in outflow from the drum.

Q. Since the level is allowed to vary, isn't there some danger that the accumulator might run dry or get too full when there is some unusual upset in the flow of overhead product from the preceding column?

A. No. Before the instrument is purchased the maximum change in the inflow for such an operation must be determined, and the controller specified and the instrument setting made with this in mind. Provision can be made for a very unusual upset by specifying a level controller in which limit or safety stops are incorporated.

Q. Now coming back to the original question on feed-rate control, wouldn't it be desirable to use an interlock when feed comes from the reflux drum of the preceding column?

4. For stable feed rate . . .



A. Such a control system (Fig. 4) will be in order when it is desired to maintain a very stable feed rate to the column. The averaging level controller will behave as explained before to permit a small change in outflow from the feed drum, even though there may be a large inflow, and will reset the control point on the flow-recording controller accordingly. The latter then acts to hold flow stable regardless of any changes in pressure drop.

In other words, you may have a situation where the control scheme of Fig. 3 won't quite do the job, as for instance where pressure on the reflux drum is not constant. Since in natural-gasoline processing, fractionating columns are operated under pressure, the head due to the liquid level in the feed drum would be but a small part of the total head. Therefore changes in pressure would alter the relationship between level and outflow, hence the interlock.

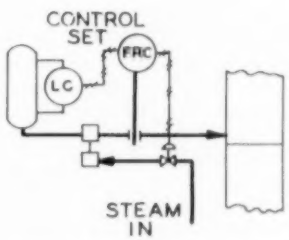
Q. It was stated that a wide proportional band would be used for the averaging liquid-level controller. Would you ever use a proportional-plus-reset controller?

A. Yes, a proportional-plus-reset instrument would be indicated where surge capacity of the feed drum was too small. With proportional alone you get deviation from the control point and so would tend to have wider variation in level. By adding reset you tend to bring the level back toward the control point so that over a period of time you stay more in the middle of the band.

Q. Suppose a steam pump were used for handling the feed . . . ?

A. That is not so common a case but is encountered now and then in natural-gasoline processing. Where this occurs we might have to use an interlock control as in Fig. 5.

5. If steam pump is used . . .



Here the level controller sets the control point of the flow controller. This is made necessary so that if steam pressure should change, resulting in feed-rate change, the flow controller will correct this right away and bring the flow back toward the set point. This change in steam pressure would be termed a "supply side load change." The steam comes from a common steam header and a diversion of steam to other uses causes a drop in steam pressure to the pump. Conversely, if other demands for steam should fall off, steam pressure to this pump would be increased.

In summary, then, any fluctuations away from the desired feed rate would be sensed by the orifice meter in the feed line and the flow controller would act to reposition the control valve on the steam line. Also, as level varies within limits in the feed drum the level

control resets the flow controller which in turn opens or closes the control valve to admit more or less steam to the pump. The feed rate is thus kept essentially constant regardless of level changes or changes in steam pressure. Although this use of the steam pump is not too often encountered in the modern gasoline plant it has been used here as another example of what is meant by cascade or interlocked control.

The same reasoning can be applied in another case that is not so common but does exist, that is, where reciprocating pumps are used but these are powered by natural gas instead of steam. Here again we could use the level controller to operate directly a control valve on the inlet gas line to the pump or, if a very constant feed rate were critical, we could reset a flow controller on inlet gas.

Many applications do not need interlocked control and it may be well to point out here . . . keep it simple and economical whenever possible . . . don't use cascade control just because it may look good, use it only when there is a definite need for it.

● **Removing the products . . .**

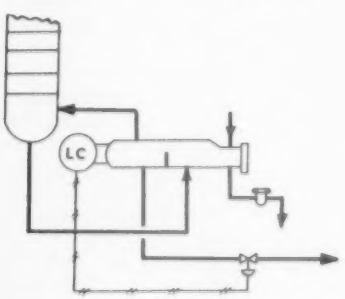
Q. What is involved in control of product removal rate?

A. Let's say we have an operation where we are making specification overhead product. Our chief concern then is to keep the product "on spec." Off-specification product is an economic loss. Therefore we must regulate rate of withdrawal of the overhead to maintain a constant composition. If we remove the product too fast, concentration of lighter components in the overhead will decrease. Too slow removal will increase lighter-components concentration. This will be immediately apparent to anyone who has ever made a material balance on a column.

Q. From this viewpoint, then, what is the best way to control the removal of overhead product?

A. The ideal way would be to control directly on the composition. There has been some development along this line, using UV (ultraviolet) or IR (infrared) analyzers to measure composition directly. However, this is not yet universally applicable or practical, so in most cases we still control on a variable other than composition, such as temperature, since this can be taken as a direct measure of composition.

6. Bottom product to storage . . .



Q. What about using a level controller as was discussed before?

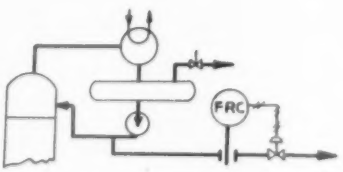
A. Commonly that is the method used for controlling rate of removal of overhead and bottoms product. In many cases we would use what might be termed "stripping-section temperature control" in which the heat supply is regulated to hold temperature constant at some selected point in the stripping section. We would then regulate the reflux to the column with a flow controller and use level controllers to regulate flow of the overhead and bottoms product. If the product went to storage the level controller would directly operate the control valve in the product line. If the product were going as feed to the next column and a very constant feed rate were essential the level controller would reset a flow controller as has already been explained.

Referring to Fig. 6, rate of bottoms-product removal must balance rate of liquid downflow in column and this can be accomplished satisfactorily as shown. Ordinarily a proportional controller will do the job here.

Q. What's wrong with regulating the flow of overhead product directly?

A. This scheme is shown in Fig. 7 . . .

7. No feed change compensation . . .

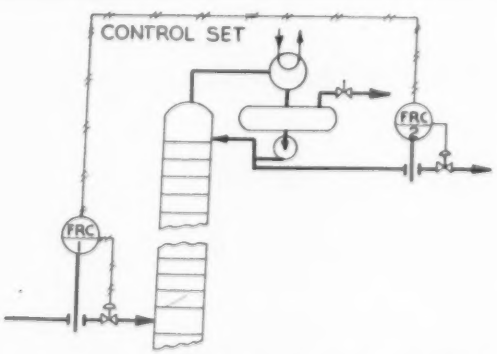


Such a control system might not be so satisfactory if feed rate and feed composition change.

Q. This brings us back apparently to the problem of feed-rate control . . . suppose there were frequent changes in feed rate . . . ?

A. A feed-to-product interlock could be used . . .

8. Feed and tops interlock . . .



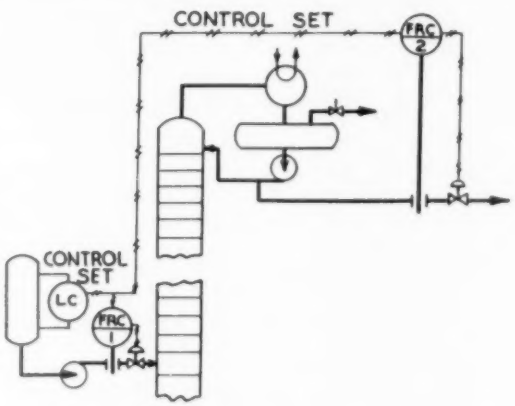
In Fig. 8, FRC-1 is a controller-transmitter which sets the control point of FRC-2. If feed flow increases

then product flow is automatically increased. Another flow interlock is also possible, such as between feed and reflux, for example.

Q. Suppose an averaging liquid-level control is used on the feed drum, how might an interlock be arranged?

A. We could use ratio flow control . . .

9. Another cascade control . . .



In Fig. 9 the level controller is used as a transmitter setting the control point of FRC-1 and FRC-2, keeping withdrawal rate of overhead product proportional to rate of feed. The controls of Figs. 8 and 9, as well as that of Fig. 7, do not compensate for changes in feed composition. In order to do so we would have to employ a still more complex system. It has been suggested, for instance,[1] that a flow-ratio controller be used to operate the control valve in the overhead products line. The ratio controller would act according to the changes transmitted by two flow transmitters, one in the feed line and the other in the overhead products line. So far that would be essentially the method of Fig. 9. However, in addition, a vapor-pressure controller would ratio set the flow controller. This system would employ then a vapor-pressure comparison method to compensate for changes in composition.

In other words, the flow ratio between overhead product and feed would be adjusted according to the difference in vapor pressure of a sample of the desired composition held in a bulb on a given tray and the vapor pressure of the material actually on the tray.

This system has been used, for example, on a deisobutanizer. A "differential vapor pressure" controller resets the flow control on reflux to compensate for changes in feed composition.

Q. The interlocks just discussed seem to be getting into the realm of "fancy" instrumentation. Would they be normally used in the field processing plant?

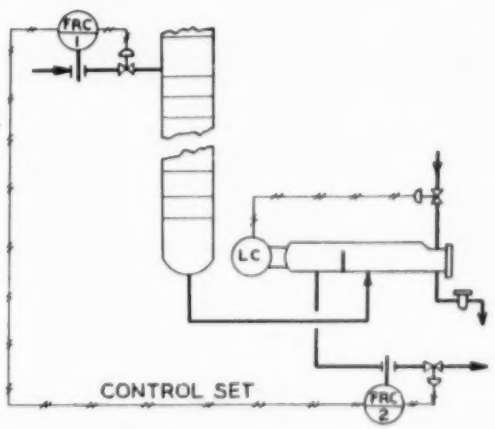
A. Such control schemes are not ordinarily employed in the natural-gasoline or cycling plant. They are reserved for special situations, such as might occur in petrochemical or perhaps in some refinery processing. The use of ratio flow control, as outlined above, might be resorted to where a very close split has to be made, as between normal butane and isobutane or, in general, between components with a boiling range spread of less than 10° F. where temperature control might not be feasible. The schemes of Figs. 8 and 9 have been presented to show some of the possibilities in what might be termed "material-balance control."

Ordinarily, in natural-gasoline processing, the feed rate does not change very much during many hours of operation and such interlocks are not justified.

Q. How about a tiein between rate of feed and rate of bottom-product withdrawal?

A. Yes, this would be an example of material-balance control. The following points as given in more detail elsewhere [2] briefly summarize this type of control: (1) it would be used where temperature control is not feasible, (2) feed composition must be checked periodically and adjustment made for any change, (3) feed drum should be large and tower provided with plenty of trays to allow for the feed composition changes, (4) trouble might be experienced due to the lag in the column, requiring a resistance and/or capacitance on the pneumatic tubing from the controller-transmitter FRC-1 in Fig. 10.

10. Feed and bottoms interlock . . .



• How about heat supply? . . .

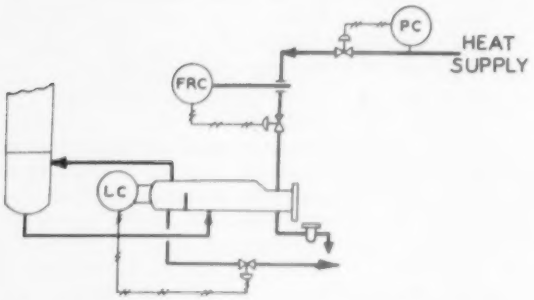
Q. It is noted that in Fig. 10 the heat supply is on level control. How does this function and how else may heat supply be regulated?

A. In the method of Fig. 10, heat is supplied at the rate required to vaporize whatever material is not removed as product according to the dictate of FRC-2. Another method would be direct flow control of steam or other heating medium as in Fig. 11. If steam is the heating medium and is drawn from a common steam header supplying other services it would be advisable to install a pressure regulator in the steam line, as shown.

This scheme would again be open to the objection that it does not compensate for changes in feed rate or composition.

Given a constant feed rate the control of Fig. 11 will maintain a fairly constant internal reflux ratio (ratio of liquid downflow to vapor upflow) in the stripping section, which is what we want. However, the L/V

11. Heat supply on flow . . .

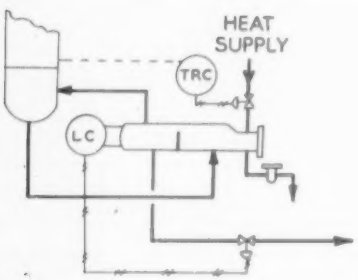


ratio should change if there is a change in feed composition. With this method it will remain constant, which might not be so good. The method of Fig. 11 could be modified by using the level controller on the reflux drum to reset the flow controller on the heat supply.

Q. What method would be used for controlling the heat supply that might be applicable for many cases of fractionator control?

A. That would be a method as shown in Fig. 12.

12. Heat supply on temperature . . .



In this case we are taking the temperature at the point of measurement as indicating the bottoms composition, assuming pressure is constant at the point of measurement.

Change in heat supply to the column will have the same effect on the stripping section as change in reflux has on the rectifying section. Both heat supply and reflux rate must be held constant, especially when trying to hold specification on product. With fixed reflux, varying the heat to the reboiler will affect both the top and bottom product in quantity and consequently in concentration of components.

With reflux on flow control and temperature controlled at one tray or point of the column, temperature and composition gradient is then fixed for the column. This method of control might be termed as stripping-section temperature control. This method then compensates for changes in feed composition. A proportional-plus-reset temperature controller is a must here. We would not attempt to control with proportional alone.

Q. In this control system then the column would be operated so that the reflux would change if column throughput were changed . . . ?

A. Change in the external reflux ratio would not be big. Here again you would have to gage by experience what normal variations in throughput may be expected and set the reflux ratio for operation just below the maximum capacity of the column or for the maximum expected during a given period of operation. This means that when you are running below the maximum you will be using more heat than is necessary to strip the feed to the desired bottoms concentration. Also the reflux ratio will be greater than was shown to be necessary by design calculations for the particular separation, so that there is also some waste in condenser cooling duty.

Q. Why operate in this manner then?

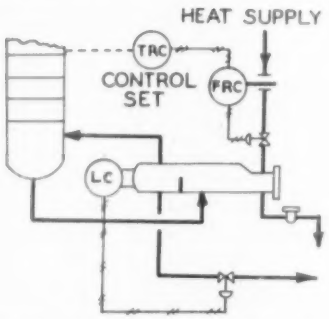
A. First of all, note that at the lower throughputs with this manner of operation you don't have to worry about product quality but should actually get a somewhat better product.

Specifically, the argument for running the column this way is that it makes the job easier for the temperature controller. This controller has a very tough job due to the many lags associated with temperature control of fractionating columns, as was mentioned before.

With a constant reflux rate, a given change in feed rate requires a relatively small change in heat supply to the reboiler, the actual amount depending on the reflux ratio and concentrations involved.

The changes which the temperature controller has to make could be reduced still further by using a cascade control on the heat supply, as in Fig. 13. The flow controller would take care of changes in steam-header pressures and other fluctuations on the heat supply side.

13. For stable heat flow . . .

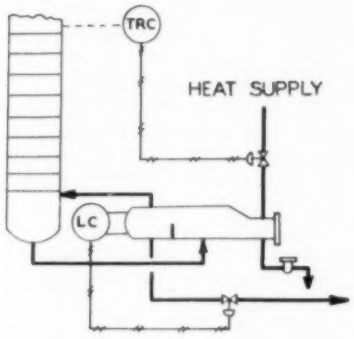


Q. It is noticed that in Fig. 12 the temperature-measuring element is located on the bottom tray but in Fig. 13 it is located some trays up the column. What is involved in location of the measurement point?

A. This brings us back in a sense to the question of how close a temperature control can be maintained. Actually we must have some change in temperature to actuate the controller. The method shown in Figs. 12 and 13 generally should be workable on changes in temperature of 1° F. or more. In other words, you must allow for changes in composition corresponding to temperature changes of not much less than 1° F.

Say, as an example, that the temperature-measuring element is located below the bottom tray and that we are trying to take a very narrow cut off the bottom. Say that variation in bottoms-product purity is strictly limited, corresponding to changes in bottom temperature of only ½ ° F. Then we must either give up this method of control and perhaps use the method of Fig. 11, or we must locate the measuring element at some other point in the stripping section where there is a greater change in the temperature between two plates for the small change in bottoms composition permitted to us by product specifications. Fig. 14.

14. Find best temperature point . . .



Sometimes the best point for control can be determined from the design calculations, but in other cases the couple must be relocated after the column has been in operation.

More detail on finding the optimum point for measurement can be found in the literature.[3 4]

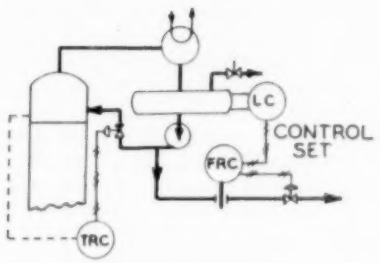
A few more comments are in order here. First, one must also think about lag when locating the measuring element. From this standpoint it would be better to locate at the bottom of the column or perhaps even in the vapor return line from the reboiler. In practice, a compromise will probably have to be made as between lag on the one hand and temperature gradient on the other. In very special cases use of rate action may be necessary or a differential temperature control. Second, in the mechanical design of the column it may be wise to provide for additional fittings so that a thermocouple or other temperature-measuring element can be easily installed at one point or another as necessary. Third, remember that a definite relationship must exist between temperature and composition and that this can be disrupted by pressure changes.

To minimize effect of pressure change one thing that might be done is to locate the pressure measurement as close as possible to the point of temperature measurement. This is a must if extremely high-purity product is desired. If pressure fluctuations affect the temperature-composition relationship, pressure compensation, at least over a limited range, may be worked into the control, the temperature control being reset in ratio to the absolute pressure.

Q. We have been discussing different aspects of stripping-section temperature control. What about rectifying-section temperature control . . . when would that be used?

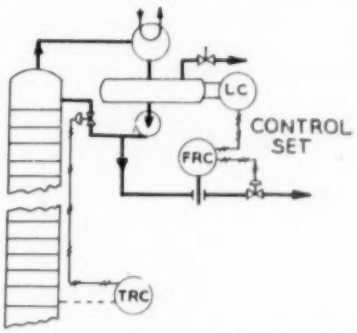
A. That might be used if we were particularly interested in the overhead product or if we could not find a point sensitive enough for temperature control in the stripping section. We could then go to a system as in Fig. 15.

15. Rectifying section control . . .



In this method a flow controller would be used on steam to reboiler, so that heat supply is held essentially constant, while reflux rate can be varied somewhat according to temperature changes. Variation in reflux rate will reflect in amount of product made and hence in composition of product. We must again find an optimum point for temperature control, one where we get sufficient temperature change to actuate the controller properly relative to a small change in overhead composition.

16. Optimum temperature point . . .



In the system of Fig. 15, as in that of Fig. 12, a proportional-plus-reset temperature controller must be used. Also, similar to the operation of the Fig. 12 system, heat to reboiler is set to give reflux ratio for maximum throughput, leading to the same considerations as to reboiler and condenser duties and product purity at lower feed rates discussed before.

Q. Would you consider the use of a proportional-reset-rate temperature controller in scheme of Fig. 16?

A. There is some pro and con on this question. Our first thought would be to consider it because of the

greater lag involved in the scheme of Fig. 16 as compared with that of Fig. 15. On second thought, however, if we used an instrument with derivative mode, change in reflux rate would be more rapid with temperature change. It might be too rapid when operating close to the maximum capacity of the column and result in flooding the top plates and off-specification product.

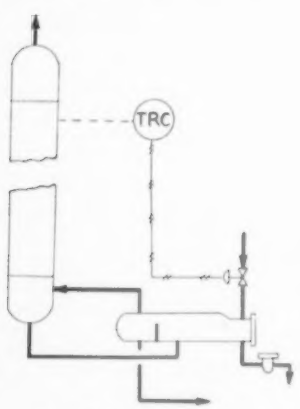
One thing that might be done is to have the temperature controller reset a flow controller on the reflux.

Q. Suppose we modified the method of Figs. 15 and 16 by having the temperature controller operate the control valve in the overhead make line and setting the reflux rate on flow control. Would there be any advantage in this?

A. In the scheme of Figs. 15 and 16, we have an averaging level controller resetting a flow controller on the overhead products line. This interlock takes pretty good care of any fluctuations in liquid flow from the condenser. Now if we decided not to have such an interlock, use of the temperature controller to operate the valve in the overhead make line would be an alternative and acceptable method. We could then argue that fluctuations in liquid flow from the condenser would be better taken care of than if the valve were in the reflux line. We might be able to get by then with a constant enough internal reflux ratio in the rectifying section, even without the use of a flow controller on the reflux.

Q. It is of course apparent, generally speaking, that a rectifying-section temperature control would be employed when taking specification product overhead and that a stripping-section temperature control would be used when making bottoms product to specification. However, suppose it is the top product we are particularly concerned with. Couldn't we still use a temperature controller operating the valve in the steam line to the reboiler, but with the temperature measuring element located in the rectifying section?

17. Lag is important . . .



A. That could and has been done, but is of course open to the objection that there would be a lot of lag in such a system. It has been done on depropanizers, for instance. It would be better, from the standpoint of lag, if you could locate quite low down in the rectifying section, but you could get by, say on a depropanizer, even with a location high up in the rectifying section. However, you would not want to try such a control scheme on a deisobutanizer. Of course, remember again that there are other factors besides the lag.

Q. What other factors?

A. Let's take a specific case such as mentioned early in this discussion. This was the deisobutanizer with average feed composition of some 90 per cent n-butane and heavier, about 8 per cent i-butane, and the rest propane. A temperature controller was used to operate the control valve in the reflux line as in Figs. 15 and 16.

In such a control (operating to hold temperature constant by varying the reflux) the time lag is certainly important in view of the close separation being made. However, another factor to be considered is the effect of varying feed composition. In this case, with the temperature controlled in the rectifying section, if we locate too close to the top, variations of propane content in the feed, say even from 1 to 2 per cent, would have an effect on this temperature control, enough effect to worry about.

In one case, by locating on the seventeenth tray from the top in a 70-tray column a location was found where: (1) effect of changing propane content was minimized, (2) temperature still varied sufficiently to give control with changing n-butane content in overhead, and (3) since this location was not too far down from point of entry of reflux, no serious lag was encountered.

It is important to note that for this particular operation, with an over-all maximum temperature gradient of only some 20° F. available, close pressure control was also necessary. In this case the pressure controller reset a flow controller on condenser cooling water.

● **Finding the flood point . . .**

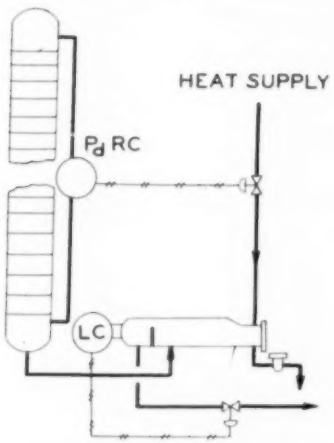
Q. Pressure control was just mentioned and this brings up another thought . . . couldn't the heat supply be regulated some way on column pressure?

A. Yes, it can be done and there is some trend currently toward use of this method, although it has not been ordinarily employed in natural-gasoline processing. What you have reference to is a system such as that of Fig. 18 . . .

What this setup does is measure the vapor flow up the column although we are actually controlling on the pressure drop. We could use a pressure controller if the overhead or condenser pressure were at atmospheric. In operating at pressures above atmospheric it would be a differential-pressure controller as shown. The differential pressure actually might be measured across some portion of either the stripping or rectifying section. Since the liquid static heads on the plates are relatively constant, any changes in these being insufficient to base control on, it is the vapor friction drop across the column that is being measured.

In column operating at close to maximum throughput this might be a quite satisfactory method. Let's look at this a little closer. It could be satis-

18. Differential pressure control . . .



factory if feed rate and composition did not change. Also, there would be a question as to the limits in pressure range for which it would be operable. Since in this method vapor velocity is measured indirectly it might be most applicable where operation is close to the maximum vapor velocity for a given column. Of course, there is no guarantee that operation would always be very near the maximum.

Q. This brings up something else . . . something that appeared in the technical literature a few years back about the use of a differential-pressure recorder to determine the flood point . . . what use is that?

A. You can use a differential pressure controller as just explained or as is done in a number of installations using differential-pressure recorders and indicators to determine the column flood point. Then the operator can be sure to stay just below flooding when running at maximum throughput.

If the column is to operate at close to maximum throughput all the time it might be preferable to employ a differential-pressure controller, as outlined before.

Despite theoretical considerations as to economical use of heat, where necessary stripping can be obtained while operating below the maximum vapor velocity, there are times when we must push the column for maximum throughput. If the maximum vapor velocity is exceeded, sometimes due to a sudden surge, the column will "puke" (sudden surge of vapor carries liquid over with it). This can be very embarrassing, it is true, but is not the only thing that can happen if vapor velocity is exceeded. The column can flood to the point where it becomes totally inoperable, or operation can continue with a partially flooded tower, the lower trays in the stripping section or upper trays in the rectifying section being flooded, resulting in poor fractionation.

It may not be immediately apparent that flooding is responsible for the poor fractionation but this can be determined by measuring the pressure drop at different reflux rates. A significant rise in the pressure drop would indicate the flood point. With a differential-pressure recorder installed, the column can be operated close to the flood point and can be trimmed back when necessary if the record shows tendency to flood.[5]

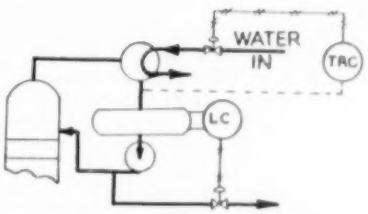
● **Pressure control . . .**

Q. The effect of pressure on temperature and the need for pressure control has been mentioned several times. Pressure control could probably be tied in with regulation of condenser cooling medium. But . . . taking the most common case, where water is the cooling medium . . . why worry about automatic control of condenser cooling water? Couldn't you just control manually with a hand valve?

A. In many cases that is just what you would do. Simply set the hand valve and possibly adjust it once in a while. Of course there would be more chance with the manual control of having not enough or too much cooling water at any given time. So at one time you might have enough water to condense the overhead vapors and cool them down to the temperature desired. At another time you might be wasting water by having the valve too wide open.

You can do better with automatic control, say as in Fig. 19, regulating the flow of water according to the temperature of the overhead condensate.

19. Regulating condenser water . . .



This might be done in those areas where water is a very scarce commodity and we cannot afford to waste it. Note this temperature controller (in Fig. 19) would be installed in addition to the temperature or other controller required for primary column control as in regulation of heat medium to the reboiler. Best results with this system would be obtained when the inlet cooling-water temperature is close to the product temperature. Proportional-plus-reset should be used. This method will hold outlet-water temperature at a maximum for given overhead vapor, inlet water, and product outlet temperatures.

Beyond what has just been said, there are other ticins involving condenser water rate, with pressure and even level control, but the primary purpose in these is to aid in control of the tower pressure.

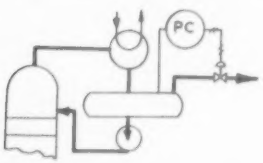
Q. Coming back then to pressure control, this apparently warrants some detailed consideration. There seem to be many methods of pressure control. In general, what determines the use of a particular one?

A. A particular pressure control method would be applied depending in general on whether: (1) overhead product were taken off as liquid or vapor, and (2) relatively large or small amount of uncondensables were present.

Q. Suppose part of the overhead is removed as a gas . . . ?

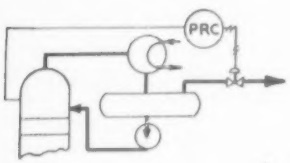
A. If there were a large amount of uncondensables (inerts or low-boilers), pressure regulation would generally be very simple, being accomplished by means of a back-pressure regulator in the vent line. Pressure control in this manner is particularly suitable when the overhead is small relative to the feed. We are thinking here in particular of an operation like a deethanizer where we are taking off a substantially narrow-boiling-range product overhead as a vapor, everything else being condensed. With a large enough flow of vapor we can employ a throttling pressure control.

20. Venting the reflux drum . . .



This indicates continuous venting of uncondensables. If pressure increases above the set point more gas would bleed out to bring the pressure back toward the set point. Since there is very little lag associated with this pressure control a proportional controller with narrow band would be good enough. The pressure measuring point could also be at the top of the tower or in the vent line itself.

21. Pressure element in tower . . .



Still another possibility comes to mind in connection with venting under the conditions where the method of Figs. 20 and 21 apply, and that is to use a temperature controller to operate the valve in the vent line.

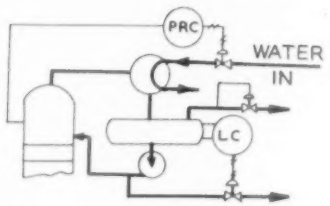
Q. Suppose there were wide load changes but pressure had to be held very constant, would you still use a proportional controller?

A. In that case a proportional-plus-reset controller would be preferable. This might be done, for instance, on a deethanizer operation where we were trying in particular to hold propane in overhead to a minimum and therefore wanted to hold a constant pressure despite some fluctuations in other tower variables. Of course it must be realized that the pressure control is not the primary or key control here. In deethanizer operation we would have to control the heat supply, perhaps with temperature resetting the flow controller on the reboiler steam line or some other interlock.

Q. Tiein of pressure control with condenser cooling water flow was mentioned. Just how would that work and when would it be applicable?

A. This could be used where there is total or partial condensation but basically negligible or small amount of noncondensables is present and product is being taken off as a liquid.

22. Noncondensables negligible . . .



The pressure measuring element can be located at the top or some intermediate point in the column. With nearly all the overhead condensed, this method constitutes an indirect control of temperature, hence of the vapor pressure of the overhead product. If pressure increases above the set point, flow of condenser water will increase resulting in lowering of the pressure back toward the set point. In this method then you can get condensation without having to worry about too much subcooling.

This method presupposes a tube-bundle type of condenser with water through tubes. Some attention must be paid to the condenser design, providing for a high enough velocity through tubes so that lag is cut down permitting use of a proportional controller with narrow proportional band.

Q. Wouldn't there be some limitations on how much water flow could be increased?

A. Settings could be made so that if the pressure should rise above that corresponding to the maximum water rate available or desirable, the back-pressure regulator in the accumulator vent line would open.

Q. Would that be a good way to operate where you had some inerts and low-boiling constituents that did not condense but accumulated as gas in the condenser? Wouldn't accumulation of such noncondensables reduce condenser efficiency and wouldn't it be best therefore to vent continuously?

A. That is a good point. Of course there is really no problem with noncondensables when you are taking off a vapor product overhead as in Figs. 20 and 21. There the inerts simply vent out with the product.

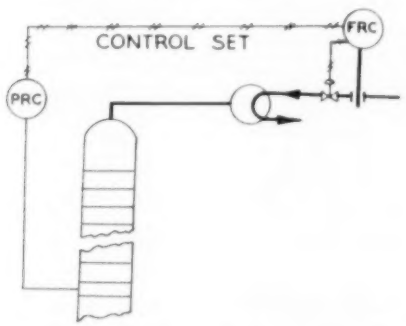
But in the method of Fig. 22 when controlling on water rate and with overhead product as liquid, venting of inerts and low boilers may become a major problem. If amount of noncondensables were quite small perhaps you would decide to operate as just noted, that is by allowing the pressure to build up to the point where the control valve in the condenser water line is wide open at which time the vent valve would open to release the noncondensables.

However, it is true that it would be best to vent the inerts continuously if possible before the valve in the water line is wide open. With inerts in the condenser, instead of controlling just on the vapor pressure of the condensate you will be controlling on the sum of the partial pressures of condensate and inerts. As inerts accumulate they will have a blanketing effect, resulting in reduction of condenser efficiency. So if you could vent noncondensables continuously at just the right rate you may be able to accomplish two things: (1) not allow condenser efficiency to be reduced too much, while (2) using the effect of the inerts to help in controlling the column pressure.[6]

Q. In the discussion accompanying Fig. 16 where we talked about a deisobutanizer, it was stated that the pressure control employed an interlock on condenser cooling water . . . why was the interlock used?

A. Yes, that was the case where we had a small amount of propane in the feed and were worried about the effect of variations in propane content. Since a close separation was being made, an interlock was used, to insure close control, in such a manner as shown in Fig. 23.

23. Fluctuations in water flow . . .



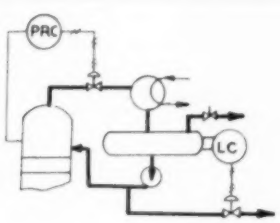
The specific reason for using the interlock is that condenser water came from a cooling-water system simultaneously serving other units. The pneumatic-set flow controller took care of pressure fluctuations in the water inlet line and so made the job easier for the pressure controller.

Q. How about the case where there is a large volume of vapor overhead and all of this is condensed?

A. The control valve would then be set in the overhead line between the column and condenser.

The back pressure is regulated in the overhead line.

24. Large volume, all condensed . . .

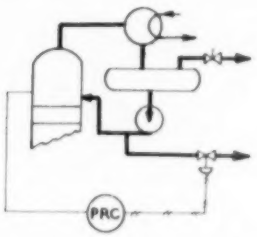


If the pressure went above the set point the valve would open wider. This would result in increased pressure in the accumulator. Condensation would be increased some, with resultant drop in pressure back toward set point.

This application is then for the case of total condensation with a narrow-boiling-range product being removed. It has the disadvantage that a large control valve must be installed in the overhead line.

Q. Could we use the pressure controller to operate a control valve in the overhead products line?

25. Flooding condenser bundle . . .



A. Yes, the back-pressure control valve can be set in the make line. This is another method applicable for the case of total condensation of overhead and is known as the "flooded condenser" method. The water rate (water through tubes) is set manually and the rate of condensation is regulated indirectly by flooding the condenser tube bundle, more or less in accordance with pressure fluctuations. If pressure increases the back-pressure valve opens wider and more tubes in the condenser bundle are uncovered. This results in decreased condensation and lower pressure.

This method will not be satisfactory unless amount of product withdrawn is large relative to amount of reflux. Amount of noncondensables must be quite small. We might get more subcooling of the product than desired by this method with some waste of cooling water.

Q. In Fig. 25 a reflux drum is shown. If this reflux accumulator is run partly full it does not seem that the flooded condenser idea would be workable . . . ?

A. That is right. In the scheme of Fig. 25 the accumulator is run full. The condenser can then be run part full as noted. This idea can be modified for cases where the condenser is below the accumulator. The flooded condenser method is not applicable where the overhead product is the feed to the next column.

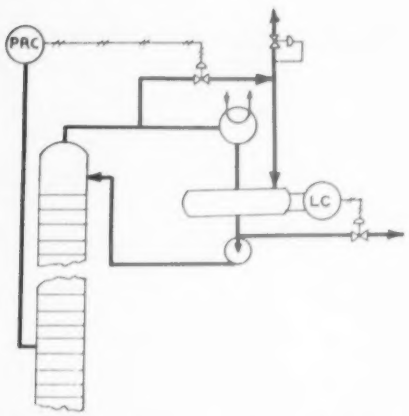
Q. Suppose that instead of the water-cooled condenser, a forced-air-cooled unit were employed, would the scheme of Fig. 25 still be applicable?

A. Yes, if an aerial condenser were used we would proceed in the same way with the pressure controller operating a valve to regulate flow in the product line and with the accumulator running full. We might add temperature indicating points at the inlet and outlet of the aerial condenser so that we would have an extra check on the operation.

Q. The possibility of too much subcooling was mentioned in connection with the method of Fig. 25. How can this be avoided?

A. Suppose again you have a large quantity of vapor overhead. You can regulate this as in Fig. 24. Then you can eliminate or at least minimize the possibility of subcooling through bypass of a small portion of hot vapor around the condenser.

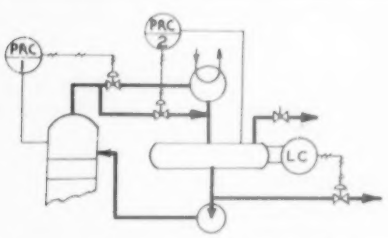
26. Bypass pressure control . . .



This again is for the case where there is quite a small amount of uncondensables and the overhead product is being taken off as liquid. This would be a better method than that of Fig. 22.

If desired the system of Fig. 26 could be modified slightly as in Fig. 27.

27. Modified bypass control . . .



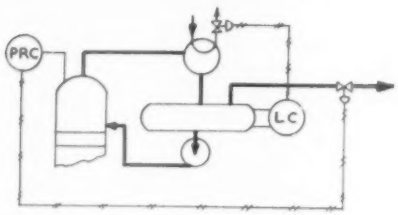
Here PRC-2 operates the valve in the bypass to hold a small constant pressure drop between the column and reflux drum. This instrument could be a pilot-type pressure controller mounted right on the control valve.

Q. Mention was made of possible tiein between level control and condenser cooling-water rate. When would this apply?

A. That would apply where there was a larger amount of uncondensables and the overhead was being taken off as vapor.

In operating on level control in this manner, the idea is to regulate cooling water to make just enough condensate for reflux. Here as in the method of Fig. 22 it is important that condenser design be such that a high water velocity can be maintained. In this connection it is also important to take steps toward minimizing any tendencies toward fouling on the water side.

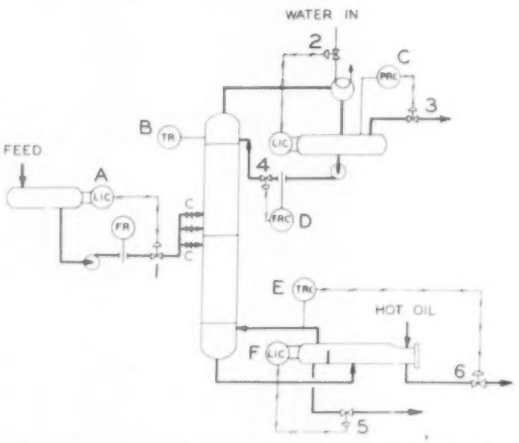
28. Level control on water . . .



2. Example of Complete Column Control

The column of Fig. 29 is a gasoline stabilizer such as might be operated in a gasoline plant not making L.P.G. The function of the stabilizer then would be to

29. Gasoline stabilizer control . . .



Summary on control valves for gasoline stabilizer, Fig. 29

Valve Number	Application	Valve Action	Minimum Flow Critical?	Size on Basis of:
1	Feed to column	Air-to-open	No	To pass two times normal flow from drum
2	Water to condenser	Air-to-close	No	Maximum water flow to condenser
3	Accumulator vent line	Air-to-close	Yes	Worst water conditions to condenser resulting in maximum amount noncondensables
4	Reflux to column	Air-to-close	No	To handle maximum pump capacity with valve wide open
5	Product withdrawal from the reboiler	Air-to-close	No	To pass twice the normal flow from the reboiler
6	Heating medium from reboiler	Air-to-open	No	Maximum hot oil flow to reboiler

take off some light material overhead as vapor in order to make natural gasoline of specified vapor pressure. For control method shown in Fig. 29 it is assumed that a small amount of low-boiling material is being vented.

If the stabilizer were followed by an L.P.G. column making a propane-butane mix, then the instrumentation could be modified say by placing a control valve in the overhead line of the stabilizer ahead of the condenser. We would in this case still be venting only a small amount of inerts or low boilers from the accumulator drum and would be holding column pressure by throttling the large amount of overhead vapor, virtually all of which would be condensed.

Referring to the letters in Fig. 29:

A. Use a 100 per cent proportional band for this level controller.

B. This temperature recorder provides a check for the operator to make sure that heavier components do not go overhead.

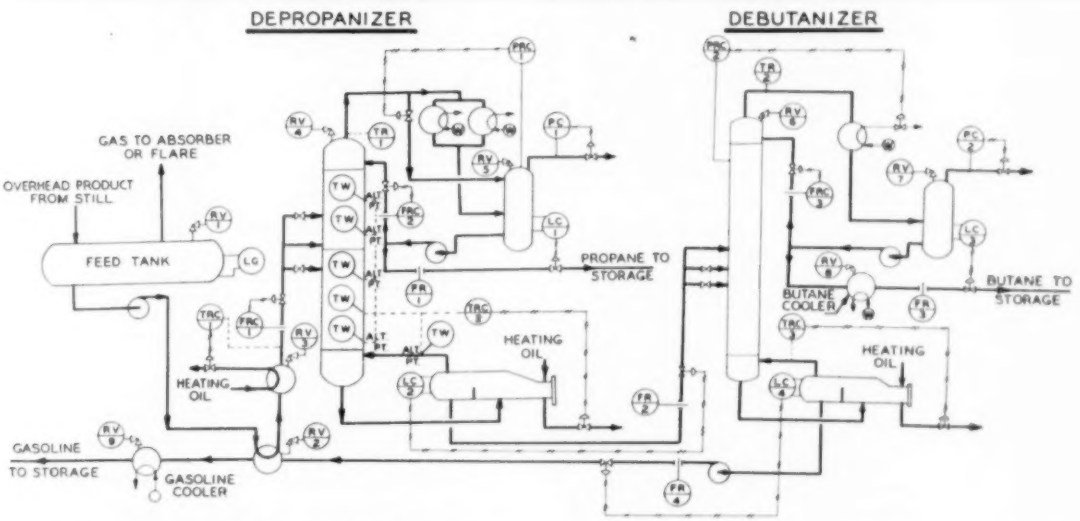
C. A narrow proportional band is all right here.

D. A proportional controller can be used here. The control point is set for reflux ratio according to the analyses of reflux drum samples.

E. This temperature controller should be proportional-plus-reset.

F. A narrow throttling range is all right here.

30. Closeup of a depropanizer-debutanizer control system . . .



3. Depropanizer-Debutanizer Systen

In Fig. 30, instrumentation on a two-column fractionating system is shown. This would be for a natural-gasoline or cycling plant in which still-top product is fed to a depropanizer and in which no separation is made between normal and isobutanes.

Some comments on this system are:

1. A large depropanizer feed tank is provided so that control of feed on FRC-1 is adequate.

2. Depropanizer feed is heat exchanged against debutanizer bottoms and further preheated with heating oil from hot-oil system. Note provision of TRC-1 to regulate amount of preheat.

3. Pressure control is with PRC-1 regulating amount of hot vapor coming through bypass around condenser to blanket the colder liquid in the reflux accumulator. Ordinarily, operation should be totally condensing in the twin parallel condenser. Under such condition, PRC-1 is the column pressure control with PC-1 not operating. The latter is set for some pressure above the operating pressure of the reflux drum, at say 10 psi. or more above the accumulator pressure.

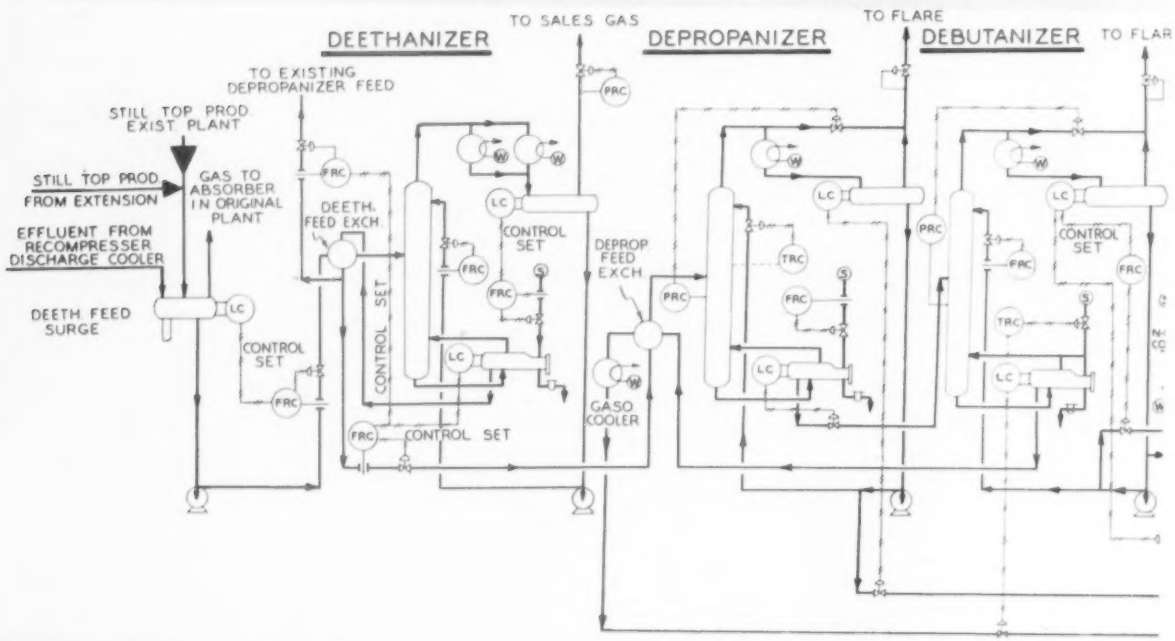
After the plant has been in operation some time conditions may change. For example, the condensers may get fouled so they no longer operate at total condensation. At this time, with more noncondensables coming off than was called for in the original design, PRC-1 will shut off the valve in the bypass around the condenser and PC-1 will take over to control column pressure by venting the noncondensables. Another situation in which PC-1 might take over the pressure control would be in the event that rich-oil stabilization does not take place as per design.

4. Debutanizer pressure control shown, with PRC-2 operating the control valve in the condenser water line, is for an operation where there will be no uncondensables or a very small amount of them. Alternatively, the debutanizer pressure could be controlled in the same way as just outlined for the depropanizer. Still another possibility would be to have the pressure controller operate the valve in the overhead product line, that is on the pump discharge.

5. Location of relief valves is indicated. However, no attempt has been made to show all details of instrumentation or process flow. Temperature and pressure-indicating points and bypass lines have been left out for simplicity.

6. Possible location of thermowells on depropanizer, to provide alternate points for temperature measurement, has been indicated to emphasize importance of providing such thermowells.

31. Here is principal instrumentation for Stano plant extension of



4. The Fractionation Train

Principal instrumentation for a four-column fractionation train in a natural-gasoline plant is shown in Fig. 31. This is taken from an actual large installation consisting of an original plant and a plant extension built adjacent to the original facilities.[7] Here the still-top product and recompression condensate from both original and newer plant are fed to the deethanizer.

Highlights of instrumentation for this particular four-column train are:

● **Deethanizer . . .**

1. Level controller on deethanizer feed drum resets flow controller on deethanizer feed pump discharge to obtain stable rate of feed.

2. Heat supply to deethanizer is regulated by interlock between level controller on reflux accumulator and flow controller in steam line to reboiler. Since no liquid product is taken off overhead, this control is set to regulate amount of propane going overhead to furnish reflux.

3. Deethanizer bottoms product (essentially propane and heavier) is split as indicated with one stream going to the depropanizer of the original plant and the other feeding the depropanizer of the plant extension. This is accomplished by utilizing a flow controller on each stream, either or both of which can be reset by the deethanizer reboiler liquid level controller. Thus it is possible to operate with either stream on flow control by manual setting if desired and the other on flow control reset by the level controller.

4. With overhead product taken off as vapor, deethanizer pressure control is obtained by throttling noncondensables leaving the accumulator vent line.

● **Depropanizer . . .**

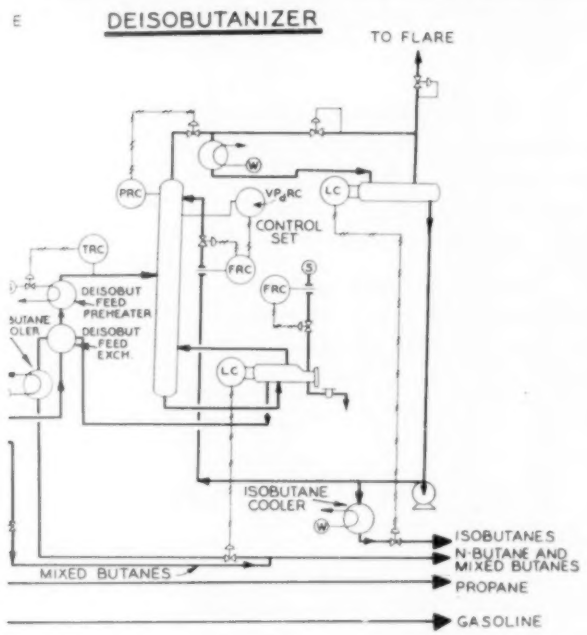
1. Design of this column calls for production of 95 per cent propane overhead. Note that a temperature controller, with temperature element located on the twenty-fourth tray from the bottom in a 35-plate column, regulates the reflux rate. Steam to the depropanizer reboiler is on flow controller. This represents a revision of original instrumentation in which the temperature controller regulated steam to reboiler while reflux was on flow control. Operation with temperature element in the reboiler vapor line was also attempted.

2. Depropanizer operates with total condensation. Pressure control originally was through regulation of vapor flow in bypass around condenser as shown. Changes have been made since this flowsheet (Fig. 31) was prepared, with elimination of the bypass control. Instead the reflux accumulators are operated liquid full and the reflux from these accumulators is controlled by use of flow controllers. Pressure control is maintained on the depropanizer system through the reflux accumulators by the use of pressure controllers (not recording). Provision is made for venting by means of a back-pressure control. This will operate, to vent ethane to flare for example, when deethanizer operation is upset with excessive retention of ethane in deethanizer bottoms product.

● **Debutanizer . . .**

1. This column is designed for flexibility in production of bottoms product ranging from a completely

Stanolind Oil & Gas Co. . . .



debutanized material to 26-psi. R.v.p. gasoline.

2. Heat supply is regulated by temperature controller operating control valve on steam line to reboiler. Thermometer bulb is located in reboiler vapor line.

3. Dual pilots on the debutanizer reflux drum level controller permit: (a) regulation of amount of mixed butanes going to storage, and (b) reset of flow controller on feed to deisobutanizer. This method of control is an additional measure taken to insure constant deisobutanizer feed rate despite abnormal fluctuations in reflux drum level. If such fluctuations should occur they would be taken up by varying the amount of mixed butanes withdrawn to storage.

● **Deisobutanizer . . .**

1. Since production of specification products from this column is a tougher job than for preceding columns, a different approach is taken with regard to the instrumentation.

2. By controlling column pressure with the pressure controller operating a control valve in the overhead line between the column and condenser, effect of change in temperature or rate of cooling water on the column pressure is eliminated. However, the reflux drum is pressured by bleeding some vapor through a bypass around the condenser to insure sufficient N.P.S.H. for the reflux pump at all times.

3. Deisobutanizer heat supply is on flow control. Means must therefore be taken to compensate for changes in feed composition or possibly small changes in feed rate. This is done by means of a differential vapor pressure controller resetting the flow controller on the reflux line.

A vapor-pressure bulb is located on the forty-eighth tray from the bottom in a 60-tray column. This bulb is filled with liquid taken from the forty-eighth tray in normal operation. Change in tray composition with resulting change in tray temperature produces a different vapor pressure in the bulb and a pressure differential between bulb and column at point of bulb location. The differential-vapor-pressure controller then acts to reset the reflux flow controller to compensate for the composition change on the forty-eighth tray.

The vapor-pressure controller has given satisfactory and very sensitive control. Sensitivity of this method in deisobutanizer operation is emphasized by the fact that a change of 1 psi. in pressure is equivalent to about ⅔° F. temperature change which in turn represents several per cent variation in terms of composition.

Acknowledgment

This special Journal section is an outgrowth of lectures on process instrumentation given at University of Tulsa.

Appreciation is expressed to industry and instrument company engineers for critical reading of the manuscript.

References

1. Tivy, V. V., "Automatic Control of Fractionating Towers," The Oil and Gas Journal, November 25, 1948, p. 85.
2. Boyd, D. M., "Fractionation Instrumentation and Control," Petroleum Refiner, November 1948, p. 114.
3. Uitti, K. D., "Effect of Control Point Location Upon Column Control," paper presented at I. S. A. meeting, St. Louis, September, 1949; Petroleum Refiner, March 1950, p. 130.
4. Bergman, D. J., "Instrumentation for Precise Fractionation. . .", paper presented at Texas A. and M. instrumentation symposium, January 1954, The Oil and Gas Journal, April 12, 1954, p. 127.
5. Kaplan, W., and Bellman, D. J., "Differential-Pressure Instruments for Improving . . . Processing," The Oil and Gas Journal, September 20, 1951, p. 319.
6. Pyle, C., "Control Systems for Distillation Towers," The Oil and Gas Journal, October 13, 1949, p. 97.
7. Reidel, J. C., "Ulysses Plant Now Stanolind's Largest," The Oil and Gas Journal, May 25, 1953, p. 156.
8. White, R. S., "Modern Process Control at East Vealmoor," The Oil and Gas Journal, October 19, 1953, p. 110.
9. Stark, E. L., "Instrumentation for Light-Ends Fractionation." The Oil and Gas Journal, January 19, 1950, p. 62.
10. Reynolds, E. H., Troutman, W., and Lawn, G., "Application of Automatic Controls to Gasoline Plant . . . Processing," The Oil and Gas Journal, April 5, 1947, p. 66.
11. Cicalese, J. J., Davies, J. A., Harrington, P. J., Houghland, G. S., Hutchinson, A. J., and Walsh, T. J., "Typical Fractionator Control Systems. . .", The Oil and Gas Journal, November 30, 1946, p. 90.
12. Mattix, E. D., "Instruments in Process Control," The Oil and Gas Journal, August 23, 1947, p. 83.
13. Breedlove, H. B., "Revised Depropanizer Instrumentation . . .", The Oil and Gas Journal, August 25, 1949, p. 132.
14. Wilson, G. W., "Fractionating Column Instrumentation," The Oil and Gas Journal, December 2, 1948, p. 63.
15. Lefkowitz, L., ". . . Control System . . . for Distillation . . .," paper presented at I. S. A. Houston meeting, September 1951.
16. Tabbert, T. D. "Instrumentation of Packaged Gasoline Plants," The Oil and Gas Journal, March 16, 1953, p. 100.
17. Cook, T. P., "Packaged Gasoline Plant . . .," The Oil and Gas Journal, October 25, 1951, p. 96.
18. Reidel, J. C., "Process Instrumentation," The Oil and Gas Journal manual reprinted from Refiner's Notebook, 1950-51.
19. "Instruments and Process Control," Delmar Publishers, Albany, N. Y., 1945.
20. Shannahan, C. E., "Refinery Instruments . . ." series in Petroleum Processing, July 1951.

Where Are We Headed on

Fractionating-Absorption Tray Design?

Here are many new concepts for an established operation. Design and performance of liquid-vapor contacting devices (as presented before the C.N.G.A. at Los Angeles in January 1954 and the N.G.A.A. at Dallas in April 1954), are covered in this special Journal section.

1. Bubble caps. 2. Perforated trays. 3. Ragatz cycling tray. 4. Shell Turbogrid. 5. Nutter float-valve bubble tray. 6. Socony-Vacuum Uniflux tray. 7. Gulf perforated tray. 8. Koch Kaskade Flexitray.

1. BUBBLE CAPS . . . Rigid Specs and Rising Costs

Spur Development Work on This Old Timer

by R. M. Young

THE petroleum industry has used bubble-cap trays for the past 34 years. This continuing popularity is due to three things. Columns equipped with bubble-cap trays can handle a wide variety of feed stocks. They give good performance over wide ranges of liquid and vapor loads. They have relatively low maintenance cost.

The early use of the bubble-cap tray was in such applications as the separation of crude-oil into gasoline, naphtha, kerosine, and so on. In these early applications, very little in the way of fractionation was required of the bubble-cap tray. Comparatively little development work was done on fractionation devices. In recent years, however, rigid product specifications and rising capital costs have required much development work to be carried out, both by the petroleum industry and by engineering companies.

Test Equipment

The research that C. F. Braun & Co. carried out from 1925 to 1950 was done on partial-tray sections in the laboratory and on commercial columns in the field. As a result of these studies, Braun engineers concluded that data so obtained are much too limited in application. It was decided to continue Braun's research program with a commercial-size test unit capable of supplying a wide range of data.

Author is with C. F. Braun & Co., Alhambra, Calif.

Fig. 1 shows a schematic diagram of the test unit. The principal pieces of equipment are: (1) a 66-in. test column, 18 ft. head seam to head seam, (2) a vapor surge tank which is 72 in. in diameter and some 12-ft. high, (3) a 150-hp. blower for circulating vapor, (4) a 15-hp. pump for circulating liquid, and (5) a liquid cooler.

Operation . . . Vapor passes from the top of the column into the surge tank where liquid droplets are settled out. The vapors then flow through an orifice run and back to the suction side of the blower. The liquid is circulated from the bottom of the column, through a liquid cooler, and to the top tray. The liquid cooler maintains constant-temperature conditions in the column. Fig. 2 shows a picture of the test unit taken during the installation of test trays.

The unit is designed to operate over a wide range of liquid and vapor rates. The maximum liquid rate is some 550 g.p.m. and the top vapor rate is 16,000 cu. ft. per minute. In addition, studies can be made with a wide variety of hydrocarbon test systems.

For studies on bubble-cap trays, the column normally contains three trays. These trays are fully equipped for all kinds of measurements such as pressure drop, hydraulic gradient, entrainment, liquid level in downpipe, and so on. In addition, the column is equipped with windows on the sides and on the top to permit visual and photographic studies.

Performance Factors

In discussing the factors that influence the performance of bubble-cap trays, we find it convenient to think in terms of a capacity graph, shown in Fig. 3. Vapor rate is plotted as ordinate, and liquid rate as the abscissa. The region of satisfactory operation is shown as a crosshatched island bounded by some six conditions that limit satisfactory performance: (1) Pulsation, (2) dumping, (3) coning, (4) blowing, (5) entrainment, and (6) flooding.

Pulsation . . . This occurs when the amount of vapor passing through a tray

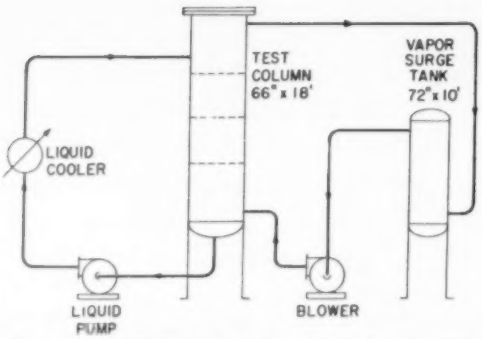


Fig. 1—Schematic flow diagram of C. F. Braun column capacity test unit. Equipment included 66-in. column and blower and pump for circulating vapor and liquid.

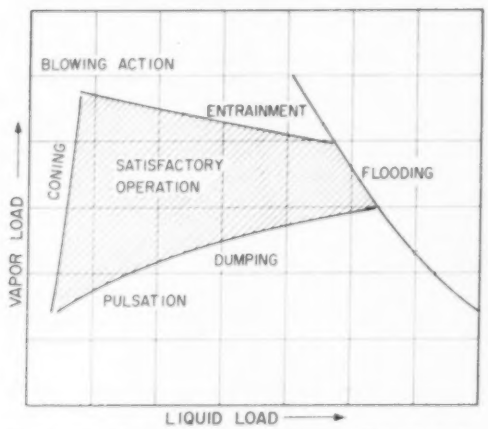


Fig. 3—Capacity graph shows limiting conditions for bubble caps.

Fig. 2—Here is the test unit on which bubble-cap performance factors were determined.

is so small that the caps pass vapor intermittently. The intermittent vapor flow causes a pulsating condition on the tray and results in poor vapor-liquid contacting. A secondary effect is that, between surges of vapor through the caps, liquid dumps through the cap riser to the tray below. This short-circuiting of the liquid further decreases the tray efficiency. Tests show that the point at which a bubble-cap tray pulsates is influenced by three things: (1) cap size, (2) slot area, and (3) properties of the hydrocarbon system.

Dumping . . . This results at relatively high liquid loads when some of the upstream caps do not pass vapor. Liquid dumps through the risers of the caps that are not operating, and decreases the tray efficiency.

Heretofore, a widely accepted view has been that dumping is caused by hydraulic gradient. That is, when the hydraulic gradient above a row of caps exceeds the pressure drop through the caps, the caps stop bubbling and liquid will dump through the risers to the tray below. Hydraulic gradient has been found to have little effect on dumping.

The major cause of dumping is the kinetic energy in the liquid stream as it leaves the downpipe and enters the tray. When the energy in this stream is greater than the vapor driving force across the caps, the liquid will dump to the tray below. These conclusions are based on tests of several types of tray layouts, using different numbers of cap rows, and a variety of hydrocarbon test systems.

It has been found that an inlet dam upstream of the first row of caps prevents liquid from impinging on the caps and reduces the amount of vapor required to prevent dumping. In many cases it is actually impossible to make a tray dump when using a properly designed inlet dam. This is a new application of a rather old device, as shown in Fig. 4.

The location and height of the inlet dam must be given careful consideration for a given service. If these two factors are not considered, the use of the dam can cause a poor distribution of liquid, and can decrease the capacity of the column.

Tray stability . . . The vapor rate needed to cause all caps on a tray to bubble is often higher than that needed to prevent dumping. And since we are interested in getting good vapor-liquid contacting, we design for vapor rates that bring all of the caps into action. When this condition exists, we say that the tray is stable.

Coning . . . The third factor that limits satisfactory performance is coning. Coning takes place when the combination of weir height and the liquid crest over the weir does not adequately seal the cap slots. If the slots are not sealed properly, vapors can pass from the caps to the tray above without contacting liquid on the tray. This results in a marked reduction in tray efficiency. Tests indicate that a liquid seal of 0.5-in. will prevent coning in most cases.

Blowing . . . Blowing results when the amount of vapor passing through the caps is so great that it literally tears holes in the liquid on the tray. This condition gives poor vapor-liquid contact with a consequent reduction in tray efficiency.

The blowing limit of a bubble-cap tray is influenced by four things: (1) size of the caps, (2) area of the bubble-

cap slots, (3) skirt clearance between the cap teeth and the tray, and (4) the properties of the hydrocarbon system.

Entrainment . . . Several undesirable effects are associated with the entrainment of liquid in a column: (1) off-grade overhead product, (2) a reduction in tray efficiency, and (3) possibly decreased column capacity.

Entrainment of liquid is of two types: (1) A relatively fine mist is carried to the tray above by superficial vapor-velocity, and (2) large droplets of liquid are jetted from one tray to the next.

The entrainment due to superficial velocity is usually less than one weight per cent of the vapor, and is somewhat independent of tray spacing. Entrainment due to a jetting action on the tray can amount to several weight per cent of the vapor. This type of entrainment occurs at high vapor rates and is greatly influenced by tray spacing, size and type of bubble caps, tray layout, fluid properties, and liquid rate.

Additional results of our work show that air-water tests alone cannot be used to predict entrainment for hydrocarbon systems. And in most cases entrainment is not a limiting factor in column capacity.

Flooding . . . This is a phenomenon well known to all operators of commercial columns. It occurs when the level of the liquid-foam mixture in the downpipe builds up and overflows to the tray above. Liquid continues to build up in the column, resulting in an inoperable condition. In the extreme, liquid flows out the top of the column.

The flood point of a column is reached when the liquid and vapor rates cause the downpipe to completely fill with a liquid-foam mixture. The flood point is computed from a knowledge of such things as pressure drop, hydraulic gradient, liquid rate, head loss in the downpipe, and aeration factor. The aeration factor is used to determine the operating level of the mixture in the downpipe from a computed clear liquid level. It takes into account the physical properties of the fluid mixture and its velocity. The factor ranges from 0.3 to 0.9.

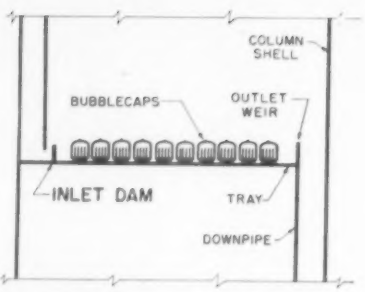


Fig. 4—Illustrating use of inlet dam in bubble-cap columns. This is a new application of an old device.

TABLE 1—SAMPLE PROBLEMS

Case No.	1	2	3	4
Service	Depropanizer		Absorber	
Liquid rate, g.p.m.	800	50	550	55
Liquid density, lbs. cu. ft.	35	35	45	45
Vapor rate, cfs.	23	29	18.5	26
Vapor density, lb. per cu. ft.	1.5	1.5	1.5	1.5
Pressure, psig.	275	275	500	500

TABLE 2—COLUMN SELECTIONS

Case No.	1	2	3	4
Diameter, in.	72	60	66	54
Tray spacing, in.	24	24	24	24
Entrainment, lb. per 100 lb.	1	2.5	<1	4.5
Upper opr. limit*, per cent of design	†125	‡110	†115	‡115
Lower opr. limit*, per cent of design	§50	¶20	§70	¶25

*Liquid and vapor
†Flooding
§Tray stability
¶Pulsation

> "Saving in capital cost . . . and improvement that can be made in the performance of many existing columns are results of our research on bubble-cap trays."

Results of Test Work

To illustrate the results of our work on bubble-cap trays, we have used a typical cyclohexane fractionator. We have made computations of column size and number of trays that would have been predicted over the past 6 years according to the best information available at the time. Fig. 5 gives a comparison of these computations.

Savings . . . Six years ago the column would have had 125 trays and would have been 144 in. in diameter. Today we would recommend a 114-in. column with 96 trays for the same service and operating conditions. As shown in Fig. 6, this reduction in column size results in a savings of $60,000 in terms of today's dollars—about one-third of the column cost.

The saving in capital cost of new columns is one result of our research on bubble-cap trays. An equally important result is the improvement that can be made in the performance of many existing columns.

Sample Problems

As part of the symposium, we were asked to size four bubble-cap columns for conditions specified by C.N.G.A. The conditions are given in Table 1, and the solutions in Table 2.

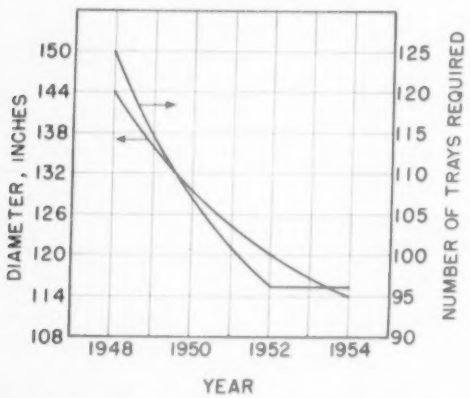


Fig. 5—Results of column diameter and number of tray computations for cyclohexane fractionator.

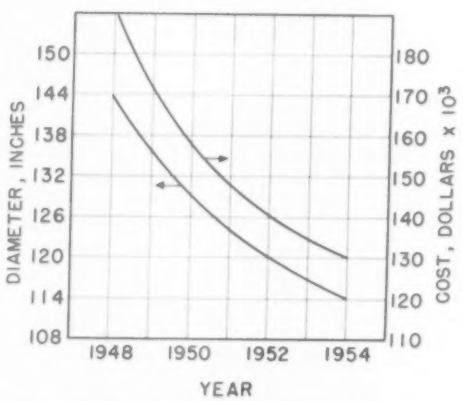


Fig. 6—Savings resulting from reduced column size in 1954 for cyclohexane fractionator.

2. PERFORATED PLATES . . . Properly Designed, These Have a Wide Range of Stable, Efficient Operation

by D. C. Lee

PERFORATED plates have been used for many years in distillation and absorption columns, but their popularity has never equaled that of bubble-plate columns. It is felt that the greater application of bubble trays has been due largely to the lack of available design data on perforated plates and to the ease of "rough design" of bubble-cap trays.

Sieve plates have been reported to suffer from a narrow operating range while bubble-cap trays operate well over a fairly wide range of rates. However, certain features of perforated plates such as low cost, high efficiency, high capacity, and resistance to fouling, make their use attractive if reliable design information is available.

Until the summer of 1949 the experience of Celanese Corp. of America had been limited to conventional bubble-cap trays. At that time an experimental study of perforated plates was initiated for the purpose of: (1) making a visual comparison of the behavior of perforated plates with bubble-cap trays, (2) determining the operating range limitations of perforated plates, and (3) developing sieve-plate design methods. The experimental results, which have previously been reported,[1] indicated that properly designed sieve plates would have a wide range of stable, efficient operation, and that the use of perforated-plate distillation and absorption columns would be desirable. Data by other authors[2,3,4] have also stressed that sieve plates can be designed to give a wide range of high-efficiency operation.

Author is with Celanese Corp. of America, at Bishop, Tex. Paper presented at C.N.G.A. Tray Symposium, Los Angeles, January 1954.

How Tests Were Made

The experimental work was performed on a 6½-ft.-diameter column with a single sieve tray operating on the air-water system. Manometers were used for measuring pressure drop across the tray. Liquid depths on the tray performance could be observed from above the tray and also from below the tray through windows. Data were taken on such operating variables as the weep point, the maximum vapor rate possible, and pressure drop.

Hole sizes . . . Runs were first made on ⅛-in.-diameter holes. These were later drilled out to ⅜-in. holes and then to ¼-in. holes. For each hole size varying numbers of holes were used to check the effect of per cent hole area, and various outlet weir settings were used to investigate the effects of different liquid depths on the trays. Fig. 1 is a plot of typical data obtained during the runs, with the curves showing the actual limits of good operation.

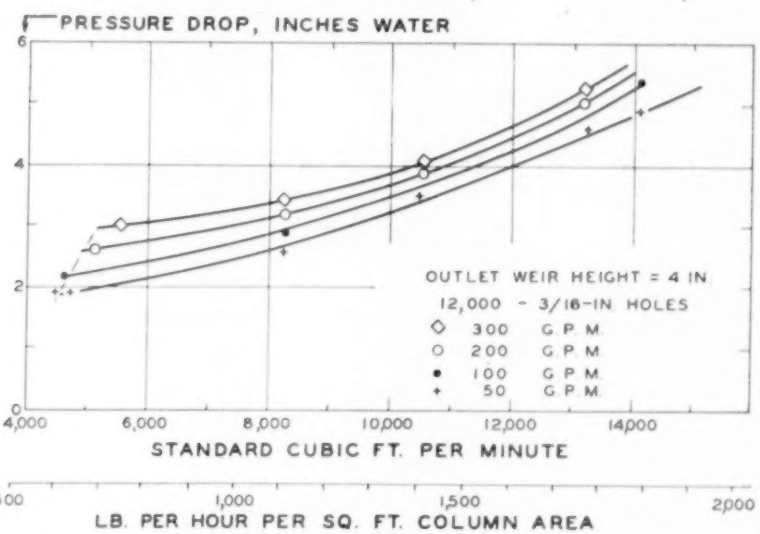


Fig. 1—Typical pressure-drop data obtained in Celanese Corp. of America tests on 6½-ft.-diameter column with single sieve tray on air-water system.

Orifice coefficients . . . These, as determined from pressure-drop measurements on the 6½-ft.-diameter tray were not always consistent, particularly with the ⅛-in.-diameter holes, where errors were introduced by a nonuniformity of hole size and shape because of hand drilling and worn drills. Therefore, a separate pressure drop study was made in a 6-in.-diameter column. In this work the holes were carefully drilled to exactly ⅛, ⅜, and ¼-in. hole sizes; and various tray spacings, plate thicknesses and drilling patterns were studied. The calculated orifice coefficients for the dry-tray pressure drop were essentially constant at about 0.85 with the plate-thickness, drilling pattern, and hole diameter having no appreciable effect on the coefficient over the range studied.

Pressure drop . . . The study of the pressure drop through dry trays in the 6-in.-diameter column was expanded to investigate the effect of liquid on the orifice coefficient. It was demonstrated that the dry orifice coefficients were not appreciably affected by the presence of the liquid above the holes and that for design purposes the total pressure drop through a sieve tray could be determined by adding the individual pressure drops through the dry tray and through the calculated depth of liquid.

Aeration factors . . . In analyzing the wet-tray pressure-drop data obtained on the 6.5-ft.-diameter tray, it was noted that the observed pressure drop through the liquid on the tray which was determined by subtracting the dry-tray drop from the observed total pressure drop, was in some cases greater than the calculated clear liquid depth on the tray and in other cases was less than the calculated value. Aeration factors, defined as the ratio of the ob-

served pressure drop through the liquid to the calculated clear liquid head, were calculated from this data.

A correlation of this aeration factor as a function of liquid depth on the tray is shown in Fig. 2, which shows the general trend of decreasing aeration factors with increasing liquid depths. This correlation gives an estimate of the pressure drop through the liquid on sieve trays as a function of weir and liquid rate.

In the range of outlet weir heights normally used (1 to 2 in.) the aeration factor is less than 1.0. Since these data are for the system air-water and the effect of different liquid and vapor densities on the aeration factor is not known, an aeration factor of 1.0 is normally assumed for design purposes so that the actual pressure drop through the liquid should be on the safe, or low, side.

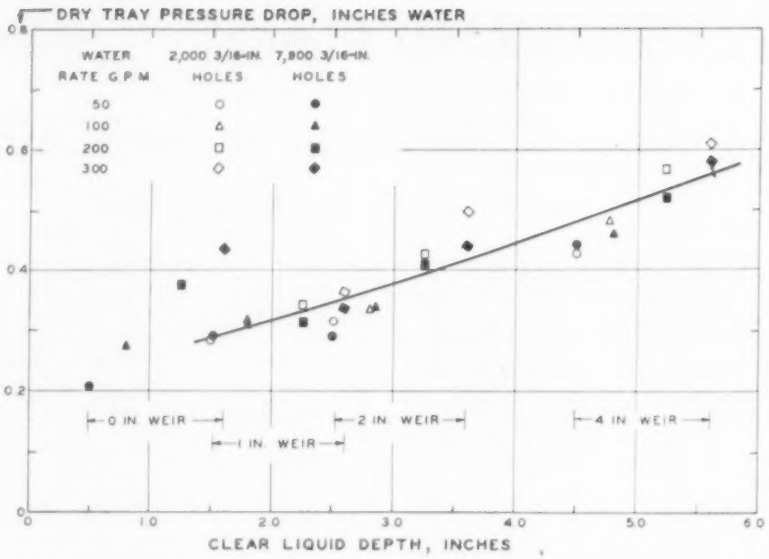


Fig. 3—Correlation of minimum allowable vapor rate on the experimental sieve tray for air-water system.

Wide range . . . The data in Fig. 1 provides an indication of the wide range of stable tray operation which was obtained in the sieve-plate study. The vapor rate at the upper limit of good operation in this series of runs was shown to be about 14,000 standard cubic feet per minute. The lower limit on the vapor rate, the point at which liquid began to weep through the holes, was found to be about 5,000 s.c.f.m. This corresponds to a stable operating range of 100 per cent vapor rate down to 36 per cent. Data on plant columns show operating ranges equally wide or wider.

Minimum vapor rate . . . A simple correlation of the minimum allowable vapor rate on the experimental sieve plate for the air-water system is shown in Fig. 3 in which the calculated liquid depth on the tray was plotted against the pressure drop necessary to support this amount of liquid without weeping. This correlation does not include such factors as surface tension, kinetic energy of the vapor, and tray diameter, which quite possibly have some effect on how far the vapor rate can be reduced. However, operating data from several perforated-plate columns indicate that the correlation is a fair method of estimating the minimum vapor rate for design purposes. Additional experimental data are needed for a more generalized correlation method which will permit more accurate calculations of the minimum rates.

What hole size? . . . In the selection of the hole size to be used, it was concluded that $\frac{3}{16}$-in. holes were generally the most desirable for commer-

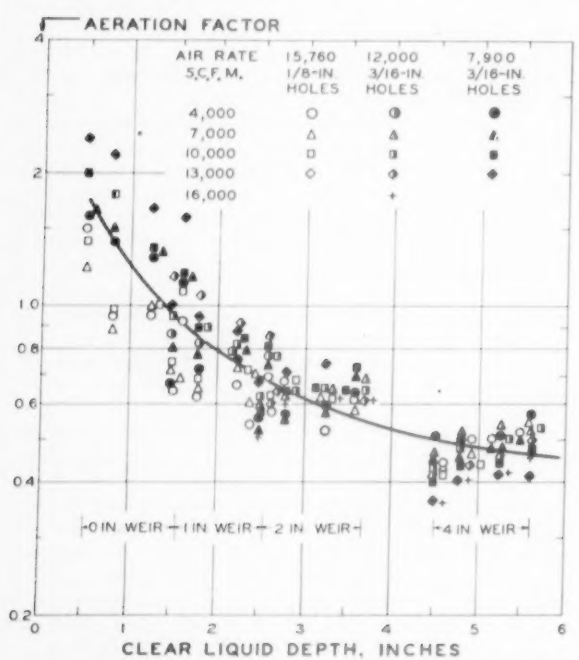


Fig. 2—Correlation of aeration factor as function of liquid depth on tray. This gives estimate of pressure drop through liquid on sieve trays.

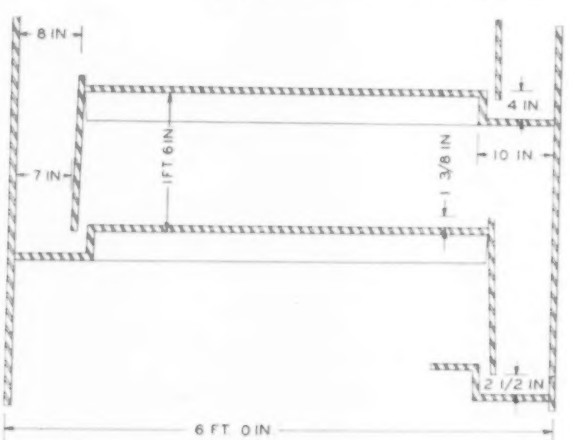


Fig. 4—Recessed inlet seal pans are one of the design features used to minimize premature weeping of liquid on inlet side of tray.

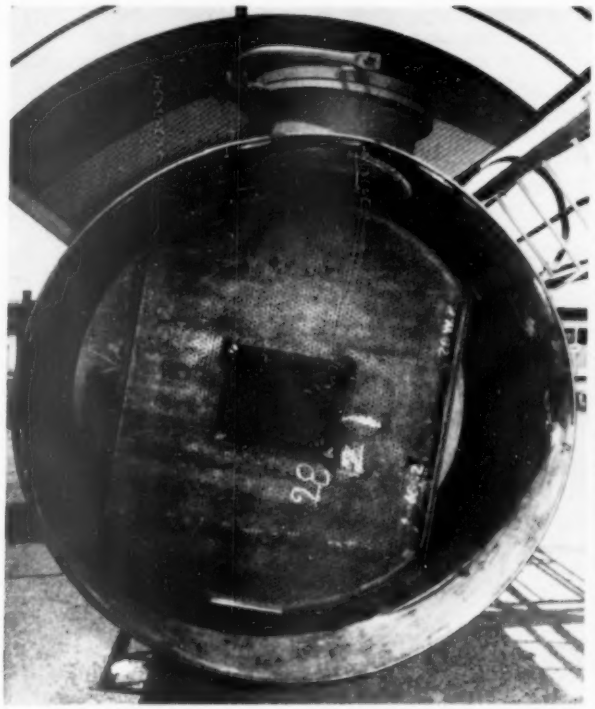


Fig. 5—Most new columns for Celanese Corp. are now sieve-tray installations. Here is one example of such an installation.

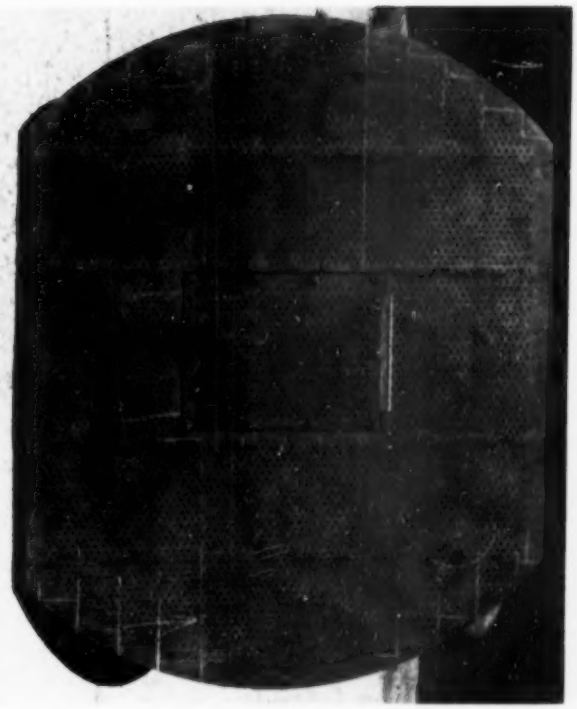


Fig. 6—Another Celanese installation. More than 70 perforated tray columns have been installed by this company in the past 3 years.

cial use. The smaller holes appeared to give better vapor-liquid contacting, with the ⅜-in. holes almost as good as the ⅛-in. holes. The use of ⅛-in. holes with heavy-gage plate is normally not practical when punched holes are used because of the mechanical limitations of the hole-punching process. The ¼-in. holes, although being the cheapest to fabricate and the most resistant to fouling, appeared to give poorer vapor-liquid contacting due to wider spacing of the holes and to a tendency of the vapor to jet through the liquid.

High efficiency . . . Visual observations of the air-water contacting obtained with the perforated plate indicated that the tray efficiency should be higher than for a bubble-cap tray. Soon after the completion of the experimental work, a 60-tray by 6.0-ft. column was designed and installed at the Celanese Chemcel plant. Performance checks confirmed the expected high capacity and wide operating range at high efficiency. Comparison of over-all tray efficiency with that of a bubble-cap column in the same service showed the sieve plate column to have a flatter efficiency curve and one which exceeded that of the bubble-cap column by 5 to 15 per cent. The superior plate efficiency of sieve plates has also been reported by Jones and Pyle.[2]

Some Notes on Design

The design of a sieve-plate column follows the same line as the design of a bubble-plate column. The column diameter, number of trays, tray spacing, and downcomer dimensions are arrived at in the same manner as for bubble trays.

Allowance can be made for the somewhat higher capacity and higher efficiency of the perforated plate column if sufficient data are available for the sizing of the column this closely. In designing the proper number of holes for the tray, the major consideration is that of calculating pressure drop through the dry tray and estimating the desired range of pressure drop for the design conditions.

Pressure drop . . . This is calculated by a suitable orifice equation using an orifice coefficient of 0.85 for ⅛ to ¼-in. thick plate. This is simplified to a special equation for ⅜-in. holes, in which the vapor flow rate per hole is expressed as a function of gas gravity, temperature, pressure, and pressure drop in inches of water. To obtain the component pressure drop through the liquid, an aeration factor of 1.0 is normally assumed for outlet weirs of about 2.0 in. in height.

Number of holes . . . Selection of number of holes to be used depends on the requirements of the system. If the design vapor rate is very high, say approaching the limiting rate based on cross-sectional tower area, the selected design pressure drop can be relatively high in order to allow the tower to be operated at much lower vapor rates if desired. Conversely, if the design vapor rate is considerably less than the ultimate capacity of the tower, then the selected design pressure drop might be taken much nearer the weep point to permit higher vapor rates to be obtained without a resulting excessive pressure drop. For normal operation, it is customary to assume a design pressure drop which will permit the tower to be operated both above and below the design rate.

Vapor rate changes . . . For cases in which the vapor rate changes considerably from the top of the tower to the base, it is necessary to calculate the hole requirements at several points through the tower. In cases of this sort where the hole requirements vary through the tower, it is customary to drill all trays with the maximum number of holes and use blanking strips tack-welded to the trays to obtain the desired number of holes in each section of the tower.

Carrying this a step further, it is pos-

sible to perforate all trays with a certain standard minimum hole spacing in cases where there is a chance that the tower service might be changed to require additional holes at some later date. A common hole arrangement in cases of this type is ⅞-in. holes on a 1⅛-in. triangular pitch where 18-in. tray spacing is used. The use of blanking strips is advantageous in permitting the use of the optimum number of holes for each tower service to maintain high tray efficiencies in all cases.

Premature weeping . . . A feature of sieve-tray operation which was noted in the visual study of the 6.5-ft.-diameter tray was the premature weeping of liquid on the inlet side of the tray due to the impact head developed by liquid as it overflowed the inlet weir. This was particularly true at high liquid rates in which cases the tray began weeping at relatively high vapor loadings, although in general the weepage was not severe and would probably have had no serious effect on tray efficiency.

Two design features have been incorporated in practice to help reduce or eliminate this problem. The first is the use of recessed inlet seal pans as shown in Fig. 4. In this type design the liquid flowing out of the downcomer has less distance to fall, and therefore the tendency of the liquid to be driven through the holes on the tray at that point is reduced. Another advantage of recessed seal pans is that it provides a deeper seal for downcomer backup. In addition to the use of recessed seal pans the trays should normally not be perforated closer than 2 to 4 in. from the inlet weir. In cases of high liquid loadings, this undrilled space could be made even wider to help prevent impact-type weepage.

In the fabrication of new towers, trays are deliberately tilted a slight amount toward the outlet weir (about ⅛ to ¼ in.) to minimize hydraulic gradient effects and to insure that workmanship tolerances in fabrication do not result in occasional trays being tilted towards the inlet weir.

Punched holes . . . The use of punched holes has led to one possible inaccuracy in the design methods although operating data to date have shown no appreciable errors from this source. The perforating process tends to shear or tear the material from the tray after the punch has penetrated about halfway through. This gives a clean sharp hole only part of the way through the tray and a rather ragged, enlarged hole the remainder of the way. By placing the sharp edges of the holes down, any changes in the orifice coefficient are minimized. Actual measured pressure drops in columns with this type tray have checked fairly closely the values calculated from orifice coefficients for smooth drilled holes.

Installation

Accompanying photographs show typical sieve-plate installation in Chemcel towers.

Most new columns for Celanese Corp. are now sieve-tray installations. More than 70 sieve-tray columns have been installed in the past 3 years, the largest being one of 11-ft. diameter. Where a few replacement trays are needed in corrosive sections of bubble-cap columns, sieve plates are commonly used as the replacements. The reason for the selection of sieve trays is to make use of their advantages when proper design methods are available.

The first cost of a sieve-tray column is substantially less than a bubble-cap column, even if no reduction in column size is made. Estimates of the costs of the plates alone show that sieve plates cost only 25 to 50 per cent as much as bubble-cap trays. With the sieve-tray installation, greater capacity and efficiency are realized, and the range of operation is satisfactorily wide for normal operation. Finally, maintenance of the columns are facilitated because of the greater ease of work inside the columns.

References

1. Mayfield, F. D., Church, W. L., Green, A. C., Lee, D. C., and Rasmussen, R. W., Ind. Eng. Chem., 44, 2238 (1952).
2. Jones, J. B., and Pyle, C., "Relative Performance of Sieve and Bubble-Cap Plates," annual meeting of the A.I.Ch.E., St. Louis, (December 1953).
3. Marsh, H. R., Proc. twenty-fifth annual fall meeting, C.N.G.A. 25, 84 (November 1950).
4. Ragatz, E. G., Proc. twenty-fifth annual fall meeting, C.N.G.A., 25, 31 (November 1950).

3. RECYCLING TRAY . . . Boosts Efficiency Absorption Columns

by Edw. G. Ragatz

IN the majority of today's commercial absorption and fractionating columns, the desired component interchange between vapors and liquid is attained by contacting an upflowing discontinuous vapor phase with a crossflowing continuous liquid phase on a series of superimposed, horizontally positioned, "trays" within the column shell. The more intimate the contact attained between upflowing vapors and each particle of crossflowing liquid on **each** tray, the more efficient is the column operation.

Under these circumstances, the first objective of the tray designer is to break the upflowing vapor stream into extremely fine bubbles as it enters the column tray, thus providing a maximum of vapor surface for the desired vapor-liquid interchange contact. If, however, the tray still exhibits an undesirable low efficiency once this vapor-dispersion objective has been properly attained, then other phases of the tray's fluid dynamics obviously call for study and improvement.

This article deals with such tray improvement, with particular emphasis being laid on increasing the efficiency of today's high-pressure, high-recovery absorbers.

Author is manager of Edw. G. Ragatz Co., Process Engineers, San Marino, Calif.

Low Absorption Efficiencies

In the late 20's when absorbers were largely operated at pressures of the order of 40-50 psig. for "butanes" recoveries of only some 75 per cent, the majority of such units exhibited reasonably good efficiencies when employing as few as 16 trays. However, such efficiencies were always less than those attained with similar tray designs employed in the plant stabilizers.

As operating pressures have increased and recovery requirements raised to their present high levels, employment of as many as 30 to 40 trays finds the conventionally trayed absorber still seriously deficient in absorption effectiveness. This deficiency imposes an economically significant added burden on the modern gasoline plant's initial construction and subsequent operating costs, and hence deserves serious consideration by the industry.

What is the problem? . . . A several-year study involving some 350 tests on 100 different commercial columns rang-

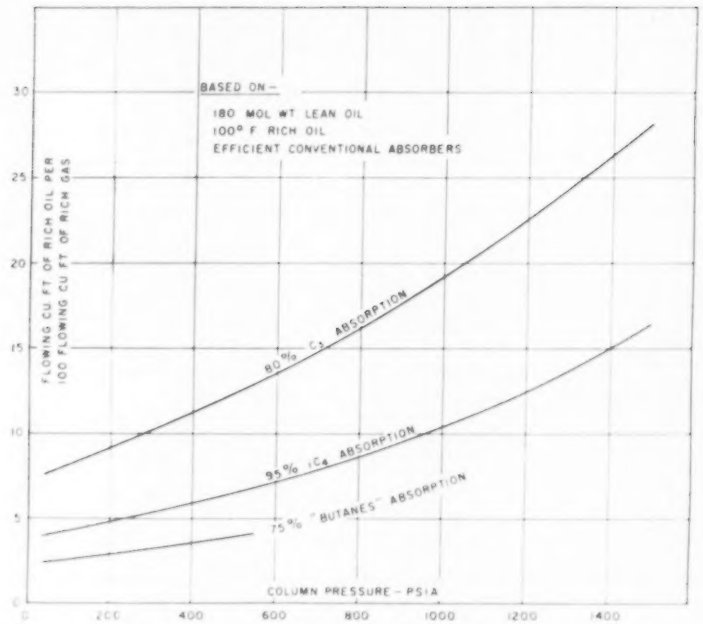


Fig. 1—This demonstrates increase in oil/gas ratios in going from earlier low-pressure 75 per cent "butanes" recovery to present-day high-pressure high-propane recoveries.

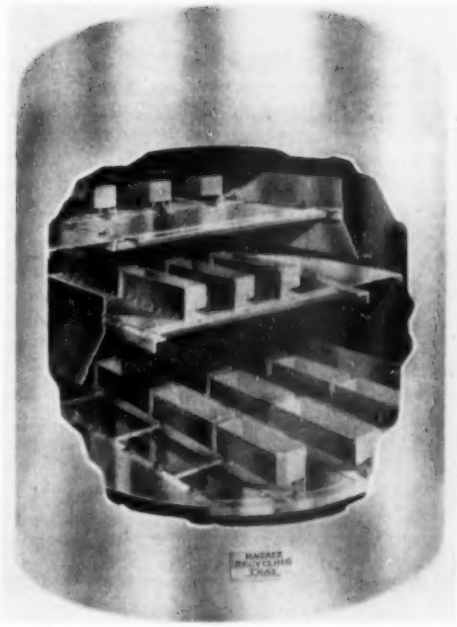


Fig. 2—Ragatz recycling tray construction.

ing in duty from 60-75 per cent "butanes" recovery at 40 psig. up to 80-95 per cent propane recovery at 850-1,500 psig. (coupled with a substantial number of "development" tests on several different experimental tray designs) lead to the following conclusions regarding today's absorber-efficiency problem:

1. Component interchange on the absorber tray is the most difficult encountered in the natural-gasoline-recovery operation. This is due to (a) extremely low concentrations of the individual components in the leaner gas streams, (b) wide "spreads" between molecular weights of the vapors and liquids involved, and (c) relatively low-temperature levels of the operation.

2. Despite these handicaps, many of the earlier low-pressure absorbers exhibited relatively g o o d efficiencies. Among the more efficient of these earlier units were many perforated-plate columns—indicating full ability of a properly designed perforated plate to effectively disperse the upflowing vapors in the crossflowing tray liquid.

3. The mechanics of duplicating on a high-pressure perforated-plate tray the degree of vapor dispersion attained on the older low-pressure trays is well understood. Yet when this degree of dispersion is so duplicated a simple high-pressure perforated-plate tray fails to duplicate the earlier low-pressure tray efficiencies by a large margin. This indicates that some factor other than "effective vapor dispersion" must be at fault.

4. In analyzing the fluid dynamics of current absorber operations versus the older lower-recovery operations, we find one striking difference, namely, that the flowing-volume ratio of oil to gas is much higher in the present-day columns. In this fact, it is believed, lies the "key" to efficient absorption-tray design for today's high-pressure, high-recovery operations.

Increased oil-gas ratios . . . Fig. 1 clearly demonstrates the increase in "flowing" oil/gas ratios which has occurred

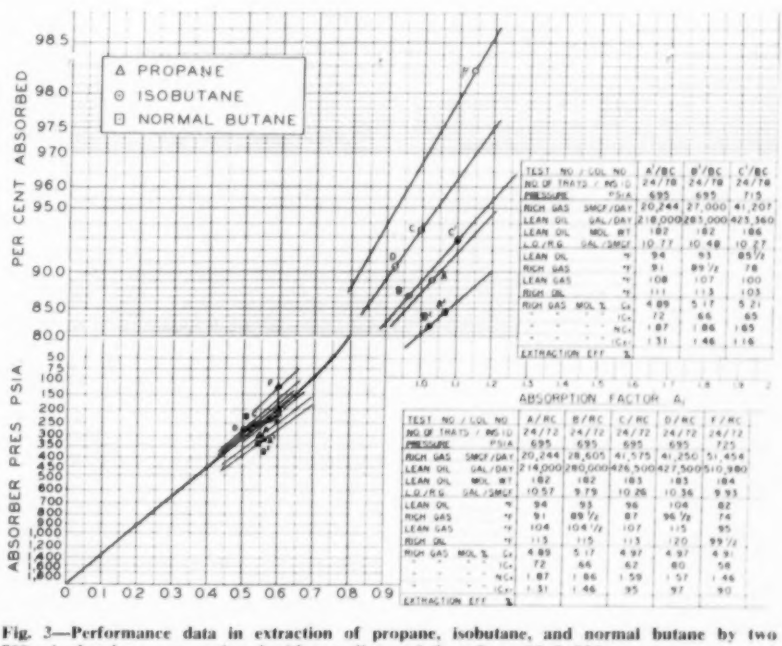


Fig. 3—Performance data in extraction of propane, isobutane, and normal butane by two 700-psi. absorbers, one equipped with recycling and the other with bubble-cap trays.

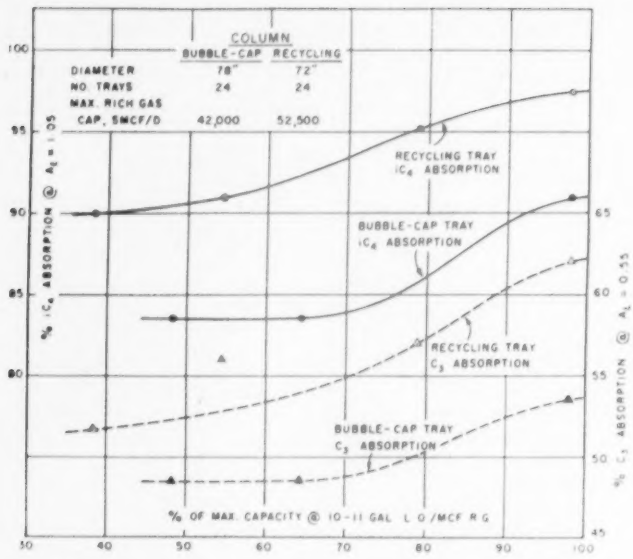


Fig. 4—Crossplotted data showing superior performance of recycling tray.

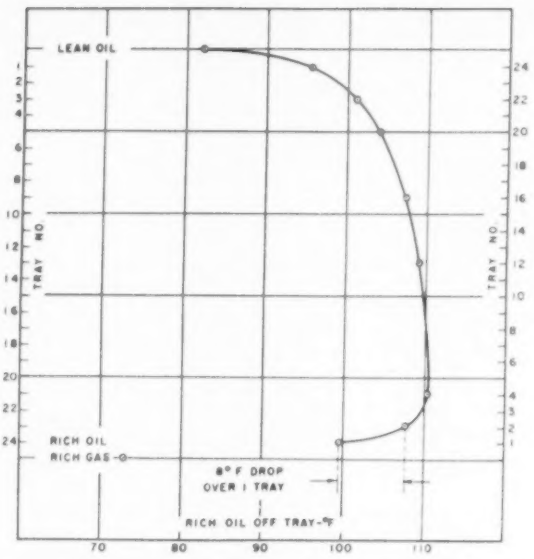


Fig. 5—Tray-temperature gradient for recycle-tray absorber.

in going from earlier 75 per cent "butanes" recoveries at some 50 psia., to present-day high-propane recoveries at pressures up to 1,500 psia. and higher. Assuming an equally effective breakup of 100 flowing cubic feet of gas, it is obvious from Fig. 1 why a 1,000-psig. operation for 80 per cent propane recovery would constitute a much more difficult gas-liquid contacting problem than a 50-psig. operation for 75 per cent butanes recovery.

The "Recycling" Tray

Shifting of the improvement emphasis from vapors to liquid indicated that, in addition to making certain that all portions of the vapor stream are equally well dispersed and held in the contacting zone for equal periods of time, the modern absorber-tray design should:

1. Make certain that no portion of the crossflowing liquid can "shoot" across the tray through the upper section of the contacting zone, while other portions are trapped in eddy currents on the tray and held therein for disproportionate periods of time.

2. Insure repeated coalescence and reagitation of the liquid stream as it crosses the tray, looking to more readily bringing all particles of the liquid stream into intimate contact with a component-exchanging vapor surface.

3. Provide sufficient residence time on the tray to insure that each particle of crossflowing liquids is brought into effective contact with its appropriate share of gas.

These desirable tray-efficiency dynamics have been realized in high degree in the "recycling" tray design illustrated in Fig. 2.

Tray construction . . . The active section of this tray consists of several appropriately perforated horizontal 14-16-gage plates over which are positioned a series of "recycling baffles." Liquid downcomers with overflow weirs are employed on alternate sides of the trays as in a conventional bubble-cap structure. The recycling baffles are interposed in several parallel rows transverse to the path of the crossflowing liquid, with alternate strips of "free" perforated plate being left between the baffle rows. The baffles rest directly on the perforated plates, thereby blanking off all underlying perforations.

Perforated plates and baffles are sized to go through conventional 18-20-in. manholes, and supported within the column on angle "grids" to which they are removably attached. Liquid downcomers, liquid receiving plates, and perforated-plate and recycle-baffle supporting grids, are normally welded permanently in place within the column shell.

Baffles . . . Each baffle consists of an open-top "box" structure. A series of holes tangent to the box-bottom are provided in the downstream side of the box, while an open "slot" is provided in the upstream side of the box immediately above the box bottom. The sides of the baffle are normally the same height as the overflow weir, and of sufficient extent to provide the necessary liquid residence time on the tray. The baffles blank off 40-60 per cent of the tray area between the downcomer and overflow weir, according to the traffic requirements of the particular tray in question.

How tray works . . . With this tray arrangement, the down-flowing liquid traverses alternate "strip" zones of gas contact and froth coalescence as it flows across the tray from downcomer to overflow weir. Through coalescence at the recycle baffles, a substantial portion of the liquid leaving a gas-contacting zone is recycled back into the bottom of said zone, while another smaller portion flows forward into the bottom of the adjacent downstream contacting zone. Through such repeated liquid "trapping," coalescence, and recycling, the aforementioned liquid-manipulation requirements for an efficient high-recovery absorption tray are realized.

As with perforated-plate trays generally, all portions of the recycle-tray gas stream are equally well dispersed, and held in the contacting zones for substantially equal portions of time. Contact with the crossflowing liquid is increased in effectiveness in the case of the recycling tray, however, by the **parallel** flow of vapor and liquid effected by the above noted repeated introduction of coalesced liquid streams into the **bottoms** of the contacting zones.

Tray Performance

The increased efficiencies attainable with this new tray structure are demonstrated on Figs. 3 and 4.

Fig. 3 presents a straight-line-chart analysis of a series of side-by-side tests

run on two 700-lb. absorbers equipped respectively with recycling and well-designed bubble-cap trays.

Fig. 4 is a crossplot of data from Fig. 3, and presents isobutane and propane yields vs. column loads at selected A_E's "bracketed" by the test operations of Fig. 3.

Test conditions . . . Both test columns were equipped with 24 trays located on 20-in. centers. The recycling-tray column was 72-in. in diameter and the bubble-cap column 78-in. in diameter. No intercooling was employed, and lean-oil to rich-gas ratios were held between 10 and 11 gal. of lean oil per M.c.f. of rich gas. Test loads ranged from some 40 to 98 per cent of maximum for each column, with the maximum rich-gas loads established at approximately 52,500 M.c.f. per day for the recycling-tray column, and 42,000 M.c.f. per day for the bubble-cap column. Maximum capacities for both columns were reduced substantially by exceptional frothiness of the absorption oil employed.

Tray comparisons . . . While the superiority of the recycling-tray column is obvious from the plotted data of Fig. 3, accurate comparison of the effectiveness of the two columns is best obtained from the crossplotted data of Fig. 4:

1. An effective operating range from at least 30 per cent to full load is clearly indicated for the recycling tray column, while it is understood that the effectiveness of the bubble-cap column breaks in the region of 45 per cent of full load.

2. For the particular tray traffic in question, the recycling-tray column has a 45 per cent higher capacity per gross square foot of column cross-section than the bubble-cap column.

3. While the efficiency of the recycle-tray column increases substantially in going from 30 per cent to full load, its 30 per cent loading efficiency is only slightly lower than the maximum efficiency attained with the bubble-cap column.

4. In going from 50 per cent to 100 per cent loading, the recycling-tray column showed higher recoveries of some 7 per cent for isobutane, and from 3.5 to 8.5 per cent for propane, compared with similar recoveries from corresponding percentage loadings of the bubble-cap column.

Increased Propane Recovery

Of these four efficiency comparisons, that of a markedly increased propane recovery in the region of 55 per cent absorption is the most indicative of an extra-high **individual** tray efficiency.

It is generally assumed that a present-day commercial column having 24 or more trays approximates an "infinite tray" unit for component absorptions below 60 per cent. Under these circumstances, all such columns should exhibit the same recoveries for the same absorption factors in the range below 0.60. However, this assumption neglects the effect of the relatively large temperature gradient developed across the bottom few trays of most non-intercooled high-pressure absorbers.

Temperature gradient . . . Fig. 5 presents the tray-temperature gradient for run "F" of the recycle-tray absorber. The large drop across the bottom three or four trays (8° F. across the bottom tray alone) applied to an extra-high efficiency tray fully explains the marked increase in propane recovery attained with the recycling-tray column.

This temperature drop is the result of heat interchange with the incoming colder rich gas. It might be assumed that for an equal such cooling one would have to have an equal gas-liquid contact, and hence should attain an equal propane recovery. Such is not the case, however, since it is much easier to attain "thermal" equilibrium on a column tray than "component" equilibrium—particularly when dealing with extra-large flowing oil-to-gas ratios.

While development of the recycling tray has laid particular emphasis on the absorption operation, it should be corresponding effective wherever extra-high tray efficiencies are of process importance.

Comparisons such as presented in this paper should obviously avoid specific identification. However, we do want to go on record that the data presented are the result of fullest cooperation of several companies and a number of individuals for which we wish to extend our keenest appreciation.

The various special features of the subject recycling tray are fully covered by United States and foreign patent applications.

4. SHELL TURBOGRID . . .

Simple Construction, High Capacity, Low Pressure Drop, Economical Maintenance

by J. A. Samaniego

TURBOGRID trays (U. S. and foreign patents applied for) are the result of an extensive research program on distillation equipment within the Shell companies. They are simple in construction and have high capacity, low pressure drop, and low liquid hold-up, while providing about the same separation, measured as theoretical plates per foot of column, as conventional-tray types. Their simplicity results in low cost and ease of maintenance.

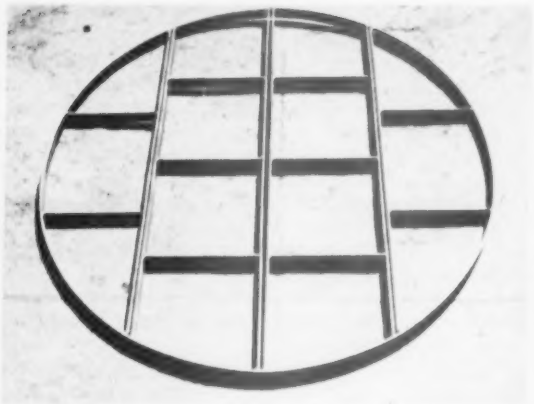
The trays consist of a flat grid of parallel slots, the grid extending over the entire cross-section of a column. The slots can be either stamped perforations in a flat metal plate or may consist of the spaces between parallel bars.

Fig. 1 illustrates a typical Turbogrid tray of the parallel-bar type. The structural support framework for the bars, the bottom side of the partly completed tray, and the top side of the finished tray are shown.

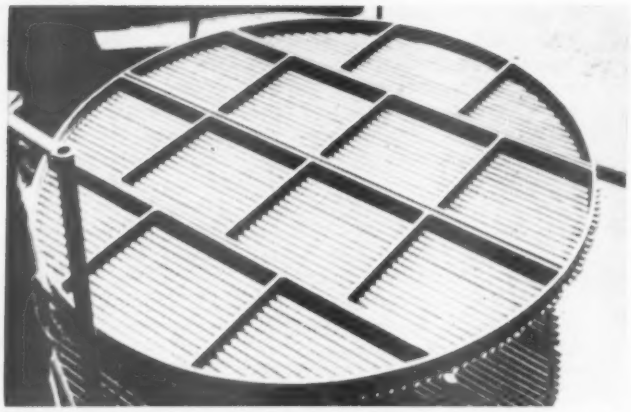
Fig. 2 shows the stamped-plate-type Turbogrid tray; the tray consists of standard tray sections with sketch plates at the tray edge. In the picture, one of the standard sections is removed; the area covered by a standard section serves as a manway in the tray. The trays are generally installed without downcomers for liquid flow. Downcomers may be used if desired, but are usually not recommended since they reduce the effective tray area, and hence the tray capacity.

Operation . . . In normal operation of Turbogrid trays, the parallel slots in the trays serve as the passages for both liquid and vapor through the tray. The flow of both liquid and vapor occurs as a cycling or intermittent jet action,

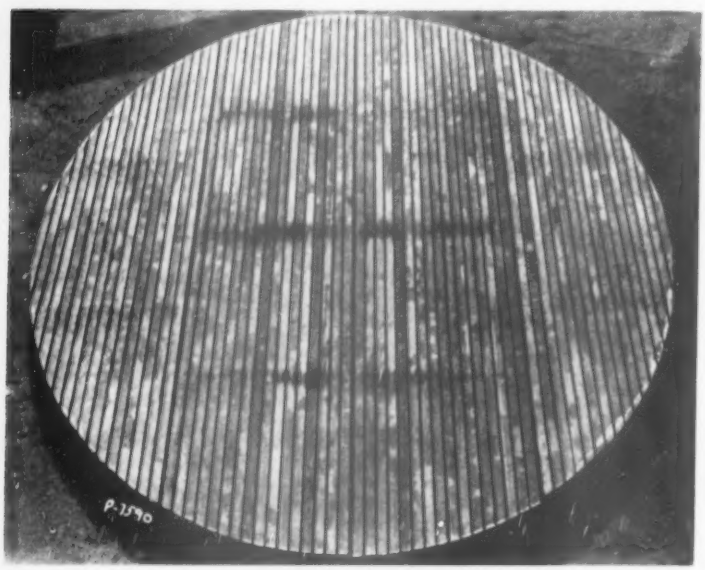
Author is with Shell Development Co., Emeryville, Calif.



Structural framework for grid tray. Framework cut into four sections in final assembly.



Bottom side of partly completed tray. Welding and trimming of bars and sectioning of tray incomplete. Stamped-plate type.



Top side of completed tray.

Fig. 1—All three views on this page are for parallel-bar type of Turbogrid.

uniformly distributed with respect to both phase flows over the entire grid pattern. The interference of the countercurrent flow of liquid and vapor through the tray results in a buildup of liquid on the tray, the liquid holdup being approximately equal to the tray pressure drop. When grid trays are installed with downcomers they perform similarly to conventional perforated trays with downcomers.

Design Variables

The significant design variables of a Turbogrid-tray column are the stream properties and rates, the structural details of the tray layout, and the specific requirements of the particular separation process. The structural details that can be varied to meet the flow or process requirements are mainly the open-slot area in the tray, the slot width, and tray spacing. The open area is selected to provide the optimum economic balance between tray capacity and efficiency. A large open area gives highest capacity but at some sacrifice in tray efficiency and operating range.

Other factors, such as pressure-drop limitations, will also affect the selection of the tray-free area. In some cases, holdup requirements govern the structural design of the trays. Where tolerance to corrosion or fouling is desired, slot width, and to a lesser extent bar shape, in bar-type trays, become factors to be considered.

The tray spacing selected represents a compromise between the factors of tray accessibility, and the relative importance of column height and diameter. Tray spacings of 12 to 18 in. normally are used in Turbogrid installations, with 18-in. tray spacing being preferred in large columns to improve tray accessibility.

How do Turbogrid Trays Perform?

The following data on five Turbogrid-tray columns in various hydrocarbon distillation services illustrate the plant-scale performance of Turbogrids. Four of these columns are normal installations of Turbogrid trays, and one is an installation with downcomers. All of the columns have equaled or bettered design performance, and they have exceeded bubble-cap-tray capacity and efficiency for cases where comparative data are available.

Column No. 1—various services . . . This is 5 ft. in diameter with 40 grid trays of the stamped-plate type installed at 12-in. tray spacing. The column has 19 rectifying and 21 stripping trays. This installation was designed to operate in a number of different services, and this flexibility in performance has been substantiated in test runs. The Turbogrid trays replaced bubble-cap trays which were limited in capacity and separation. However, other plant changes concurrent with the Turbogrid-tray replacement preclude an exact comparison with the original bubble-cap column in this case.

Table 1 summarizes the rate and performance data at 15 psig. for operation of column No. 1 with grid trays installed for two different feed stocks. Feed stock No. 1 was a full-boiling-range straightrun gasoline and feed stock No. 2 was prefractionated straightrun gasoline bottoms. Representative feed, tops, and bottoms A.S.T.M. distillation curves are shown in Fig. 3 for runs

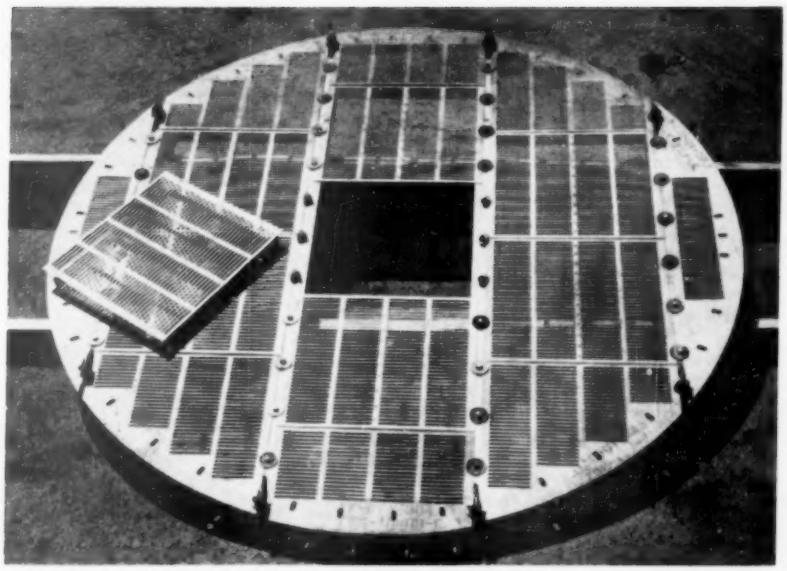


Fig. 2—Here is a stamped-plate type of Turbogrid tray, consisting of standard sections with sketch plates at tray edge.

Nos. 3 and 7, feed stocks Nos. 1 and 2, respectively.

Fig. 4 illustrates the separation achieved with both feed stocks, measured as initial boiling point of bottoms minus end point of the tops, as a function of the percentage of design rates and the internal reflux-to-feed ratio. The data show that design separation is significantly exceeded at design feed and reflux flows and that performance is still satisfactory at 120 per cent of design feed rates. It appears, furthermore, that design separation can be expected for rates as low as 60 per cent of design, indicating a twofold operating range in this service while meeting product specifications. The column has also performed satisfactorily as a pressure distillate stabilizer and as a debutanizer.

Calculated bubble-tray capacities for well-designed bubble-cap trays for the test rates show that at 18-in. tray spacing, the bubble-cap trays in the original installation would be overloaded (except in Runs 4 and 8), with calculated downcomer backup of clear liquid equaling of exceeding the tray spacing in Runs 1, 2, 5, and 6.

Column No. 2—deethanizer service . . . This column is 4 ft. in diameter in the rectifying section and 5 ft. in diameter in the stripping section. The grid-tray installation consists of 19 rectifying and 11 stripping trays at 12-in. tray spacing; the bubble-cap installation it replaced had 13 rectifying trays and 16-in. tray spacing and 9 stripping trays at 24-in. tray spacing. The grid trays are of the bar-type construction.

The column is used to fractionate a feed consisting primarily of C_2's and C_3's. The principal function of the column is not strictly deethanization but rather production of a top product containing small amounts of C_3's. The original bubble-cap column performed satisfactorily at a feed rate of 4,950 bbl. per day and 500 psia. to give 96.8 per cent propylene recovery in the bottoms and 48.8 per cent of C_2's going to tops. However, at higher feed rates the column would not operate satisfactorily unless the reflux rate were reduced, thus adversely affecting the separation. Also, the bubble-cap column would not perform satisfactory with a feed containing a high percentage of C_2's. The Turbogrid installation operates with desired reflux and reparation for the higher average feed rate now required, 6,000-6,500 bbl. per day, and can also handle the maximum feed rate of 7,400 bbl. per day if necessary.

Comparative bubble-cap and Turbogrid-tray performance is summarized in Table 2 for flow rates that could still be handled satisfactorily by the bubble-cap column. It is seen that the grid-tray installation achieves a separation equal to the bubble-cap trays at flow rates close to the maximum for the latter. The separation shown is maintained at feed rates of 7,400 bbl. per day for the grid-tray installation, while in the case of the bubble-cap tray it deteriorates rapidly for feed rates in excess of 5,000 bbl. per day.

Column No. 3—depropanizer . . . Turbogrid trays in this column are in the stripping section of a 5-ft.-diameter depropanizer column operating at 230 psig. In this installation, 19 Turbogrid trays (15 at 12-in. tray spacing, 4 at 18-in. tray spacing) replaced 14 bubble-cap trays at 18-in. tray spacing. The circumstance requiring the change from bubble-cap to Turbogrid trays was not in this case one of capacity or separation limitation of the bubble-cap installation.

A routine column inspection had in-

TABLE 1—PERFORMANCE OF TURBOGRID TRAYS IN GASOLINE FRACTIONATION, COLUMN NO. 1

(Stamped-plate-type trays, 12-in. tray spacing, 5-ft. diameter, 19 rectifying trays, 21 stripping trays)

	Feed stock No.1 (full boiling range straightrun gasoline)				Feed stock No. 2 (prefractionated straightrun bottoms)			
Run No.—	1	2	3	4	5	6	7	8
Flow, bbl. per day feed	5,300	6,400	5,720	4,384	6,000	5,750	5,700	5,410
Tops	4,100	5,100	2,840	3,400	4,350	2,100	2,250	2,630
Bottoms	1,200	1,300	2,880	984	1,650	3,650	3,450	2,780
Internal reflux per feed	0.522	0.332	0.627	0.358	0.472	0.686	0.491	0.343
I.b.p. bottoms—e.p. tops	28	—5	26	10	—22	10	16	12
°A.P.I. feed	59.2	61.5	58.0	59.4	50.8	51.5	51.3	51.2
Tops	62.7	66.1	67.0	63.6	53.5	58.4	58.1	57.2
Bottoms	46.8	46.8	48.0	45.3	44.8	48.2	48.2	47.9
Per cent design rates	137	132	101	96	145	128	110	91

TABLE 2—PERFORMANCE OF TURBOGRID TRAYS IN DEETHANIZATION

(Turbogrid trays—19 rectifying, 11 stripping, 12-in. tray spacing; bubble-cap trays—13 rectifying, 9 stripping, 16 and 24-in. spacing; feed rate 4,800 bbl. per day; reflux rate 2,000 bbl. per day)

	Per cent recovery in tops		Per cent recovery in bottoms	
Component	Bubble cap	Turbogrid	Bubble cop	Turbogrid
C_2=	59	66		
C_2	49	45		
C_3=			95	95
C_3			97	98

dicated the bubble-cap trays to be badly corroded, with tray failure and consequent poor performance incipient. Bubble-cap tray replacement could not be obtained in the requisite time, while grid trays were designed, fabricated, and installed within 6 working days.

The performance of the column was improved by the installation of grid trays in the stripping section. Comparative recoveries before and after the change, for normal feed and reflux rates, are:

	Bubble-cap trays	Turbogrid trays in stripping section
Propane recovery in tops, per cent	98.9	99.3
Butane recovery in bottons, per cent	97.7	98.2

The Turbogrid trays gave satisfactory separation for feed rates from 1,900 to 4,900 bbl. per day, and did not flood at the latter rates (calculated as 80 per cent of capacity). Test-run data gave a calculated grid-tray efficiency of at least 60 per cent at 2,540 bbl. per day feed and 2,890 bbl. per day reflux, based on the key components propane and isobutane. The low propane content in the bottoms precluded a more exact efficiency determination.

Column No. 4—debutanizer . . . This is a 6-ft.-diameter debutanizer. The column has 20 rectifying and 14 stripping Turbogrid trays at 18-in. tray spacing which replaced, tray for tray, the original bubble-cap trays. This column has not been operated at high capacity because of condenser and feed-supply limitations; its tray efficiency at low feed rates is summarized below:

Flow rates, bbl. per day		Rectifying section (per cent)		Stripping section (per cent)	
Feed	Reflux	Capacity	Tray efficiency	Capacity	Tray efficiency
7,300	2,200	28	26	30	44
10,380	2,660	39	40	64	62

Ordinarily, use of Turbogrid trays at 25-40 per cent of capacity is not recommended. The separation achieved in this column at low rates, however, has been satisfactory and the tray efficiencies obtained in the test runs were substantially in agreement with those used in the design procedure for grid trays.

Column No. 5—deethanizer . . . This last example features the only plant installation using trays with downcomers. In this column, a deethanizer, 16 grid trays replaced an equal number of bubble-cap trays at 24 and 30-in. spacing in the stripping section. The purpose of the installation was to increase column capacity. The installation with downcomers was chosen to avoid mechanical complications attending the removal of downcomers welded to the column shell. Performance of the installation has been satisfactory for rates 25 per cent in excess of those limiting bubble-cap-tray operation, and no loss in separation has been experienced. The separation achieved in the original bubble-cap-tray installation under near-capacity conditions which has been duplicated or bettered in grid-tray operation is:

	Recovery in Tops	Recovery in Bottoms
C_2's and lighter, per cent	98.8	1.2
C_3's and heavier, per cent	10.3	89.7

This separation has also been achieved in the Turbogrid installation for feed rates as low as 75 per cent of the attaintable bubble-cap rates. The maximum column capacity with grid trays, which has not yet been reached, is estimated to be 35 per cent greater than the limiting bubble-cap column capacity.

It is evident from these performance studies that in the operations considered Turbogrid-tray capacity is substantially greater than that of the bubble trays replaced, and that in the cases where comparisons were possible, the separation efficiency of the Turbogrid column is superior. Their simplicity, which generally results in lower-cost installations and easier maintenance, are additional attributes of Turbogrid trays.

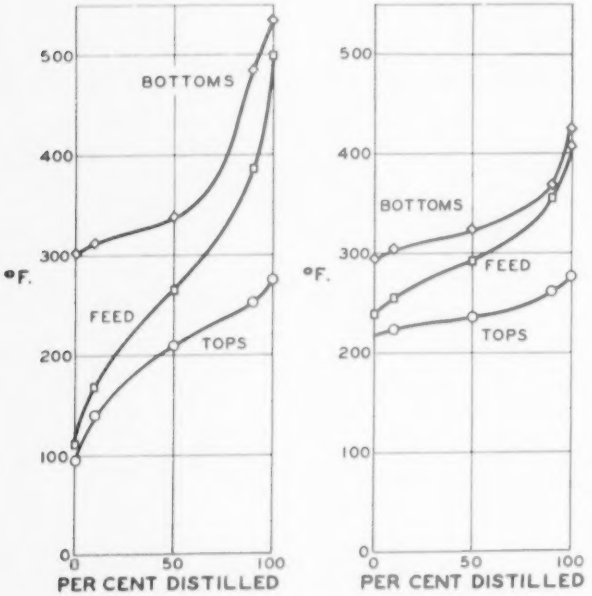


Fig. 3—Performance of Turbogrid trays in gasoline fractionation, column No. 1, A.S.T.M. distillation data.

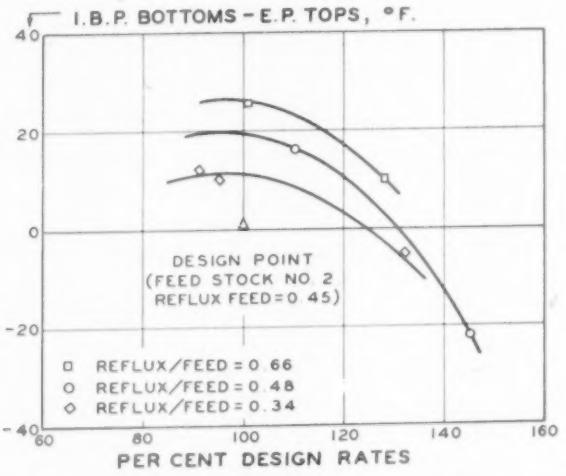

I.B.P. BOTTOMS – E.P. TOPS, °F.
DESIGN POINT
(FEED STOCK NO. 2
REFLUX FEED = 0.45)
□ REFLUX/FEED = 0.66
○ REFLUX/FEED = 0.48
◇ REFLUX/FEED = 0.34
PER CENT DESIGN RATES

Fig. 4—Performance of Turbogrid trays in hydrocarbon fractionation column, column No. 1. This is for 40-plate column, 5 ft. diameter, 12-in. tray spacing, feed stocks No. 1 and 2. (See Table 1.)

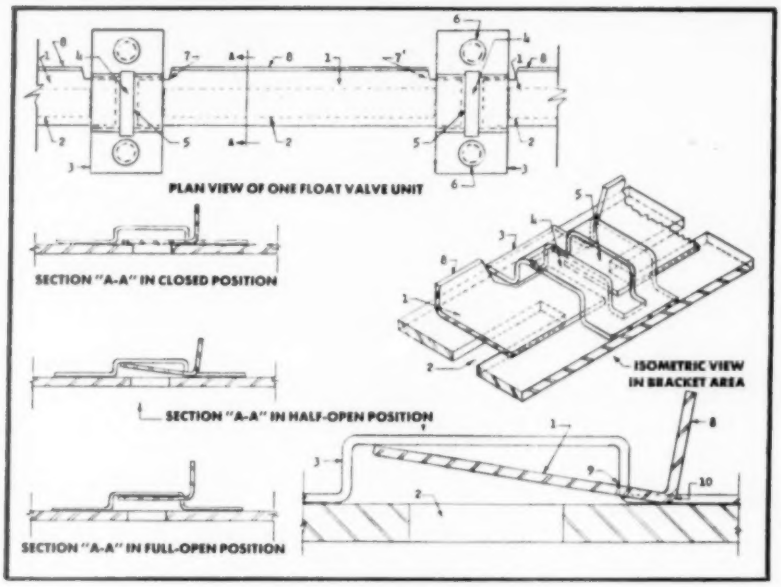

PLAN VIEW OF ONE FLOAT VALVE UNIT
SECTION "A-A" IN CLOSED POSITION
ISOMETRIC VIEW IN BRACKET AREA
SECTION "A-A" IN HALF-OPEN POSITION
SECTION "A-A" IN FULL-OPEN POSITION

Fig. 1—Details of float-valve bubble-tray unit.

Fig. 2—An assembled removable tray for 30-in. tower.

5. FLOAT-VALVE BUBBLE TRAYS

. . . Designed as High-Capacity Bubble Tray Which Would Also Be Efficient at Reduced Capacity

by I. E. Nutter

THE name float valve is descriptive of floating pivotal valves that involve a new principle. The valves are heavier on one edge than on the opposite edge and are retained on the tray to limit vertical or horizontal movement. As a contact medium is passed upwardly through the tray, a floating pivotal movement is attained whereby the light edge of the valve is initially urged away from its seating, over an opening on the tray floor, by pivoting at the heavier edge and finally the heavy edge is urged away from its seating, over the opening on the tray floor, by pivoting at the light edge. The merit of this movement will become evident in the description of operation.

Author is with Nutter Engineering Co., Amarillo, Tex.

Float-valve bubble trays are the result of development and study of bubble-tray performance started in 1945. The purpose stimulating this development was to produce a bubble tray of high capacity with superior efficiency that would also operate with good efficiency at reduced capacity. During the first several years of development, two distinct versions, other than the present equipment, were studied. The first installation of float-valve trays was in September 1951. This installation was in a 6-ft.-diameter, 16-tray absorber on 24-in. tray spacing operating at about 240 psia. and equipped for experimental testing and in regular service at a natural-gasoline plant in Carson County, Texas.

Construction of Float Valves

Float valves may obviously be constructed in many forms in conformity to the basic principle just outlined. Of the many forms investigated, the form described in this article was selected for commercial use because of its simplicity, economy of construction, and adaptability to variation in design to satisfy performance requirements. A plan view of one float-valve unit, sections of the valve in all limit positions, and an isometric view in the area of the retaining bracket are shown in Fig. 1.

Assembly . . . The float valves and associated openings in the tray floor are arranged in rows. The retaining brackets at the ends receive corresponding ends of adjacent valves in the same row and the openings in the tray floor extend the full length of span between the bracket edges. The tray deck is solid underneath the brackets to retain the section of deck in a rigid, integral piece and slots are provided centrally across the top of the brackets to permit the escape of gas off the ends of the valves so as to purge, or sweep away, any solids that might accumulate under the brackets and interfere with the movement of the valves. The brackets are positioned transverse and centrally to the tray openings and in standard assembly are secured by two rivets as shown.

The float valves and brackets are made of light-gage stainless-steel material as a standard. To date all jobs, except one each using 16-gage and 18-

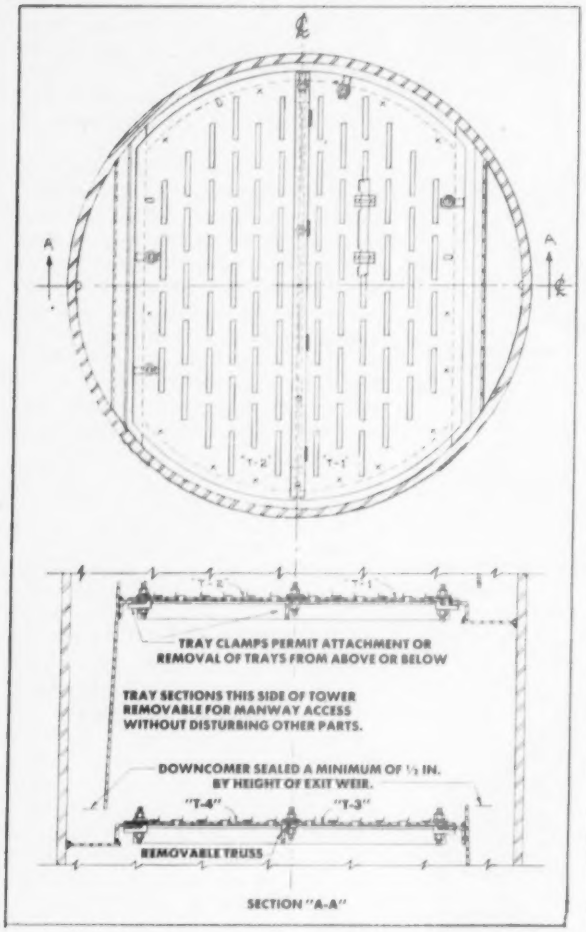

TRAY CLAMPS PERMIT ATTACHMENT OR REMOVAL OF TRAYS FROM ABOVE OR BELOW
TRAY SECTIONS THIS SIDE OF TOWER REMOVABLE FOR MANWAY ACCESS WITHOUT DISTURBING OTHER PARTS.
DOWNCOMER SEALED A MINIMUM OF ½ IN. BY HEIGHT OF EXIT WEIR.
"T-4"
"T-3"
REMOVABLE TRUSS
SECTION "A-A"

Fig. 3—Single-flow float-valve bubble tray.

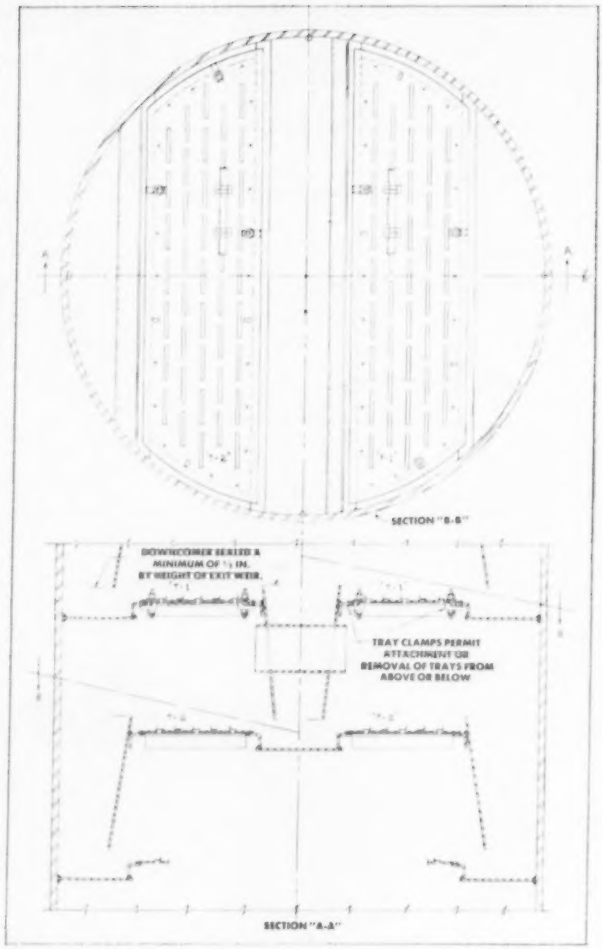

SECTION "B-B"
DOWNCOMER SEALED A MINIMUM OF ½ IN. BY HEIGHT OF EXIT WEIR.
TRAY CLAMPS PERMIT ATTACHMENT OR REMOVAL OF TRAYS FROM ABOVE OR BELOW
SECTION "A-A"

Fig. 4—Double-flow float-valve bubble tray.

gage, have been 20-gage thickness. Referring to the large scale sectional view in conjunction with the plan in Fig. 1, one side of the valve is wider by extending laterally outward intermediate the end sections and turns up to form an L-shaped section. This edge of the valve is therefore the heavy edge because of the offset to one side in width and the upward extending flange. As the opposite, or the light edge of the valve, which raises initially, opens, the offset inner edge of the ends of the heavy side of the valve are raised to, or above, the tangent point of the rounded inside corner at the bottom of the sides of the bracket. This occurs as the valve pivots about the heel of the L-shaped section of the valve, which is offset and outside in respect to the point of contact between the valve and bracket. This construction permits free movement of the valve in its retaining brackets through all positions and is economical to manufacture.

Operation of the Tray

A photograph of an assembled removable-type float-valve bubble tray for a 30-in. i.d. tower is shown in Fig. 2. Float valves are applied to the tray in parallel rows positioned at right angles to the direction of liquid flow across the tray with the light edges facing into the flow. Although other arrangements may be desirable for certain applications, it is believed this arrangement is most generally desirable and is shown in Fig. 3 for a single-flow tray and in Fig. 4 for a double-flow tray. Referring to Fig. 3, all trays utilize the exit weir to seal the base of the entrance liquid downcomer on the opposite side of the tray and downcomer seal weirs are not used adjacent to downcomers. The tower may be fully loaded with either liquid or gas flow initially without interruption or adjustment of either while turning on the other phase.

Operation . . . Assume that the liquid phase, such as in an absorber, is turned on first. With liquid phase in operation, the liquid flows smoothly across the tray with a minimum of gradient because of practically no obstruction. However, even with a minimum flow, sufficient gradient exists to submerge the valves near the entrance side of the tray in more liquid than on the exit side. Before gas flow is started, a moderate weep prevails through the valves because of imperfections of fit. However, such imperfections of fit are of capillary magnitude and, as the first traces of gas flow starts and sufficient pressure differential is established across the tray to initiate such flow, all weeping in all areas of the tray ceases even with normal liquid flow. Even with maximum liquid flow, the valves remain closed because the weight of liquid downward is always greater than the lateral force of liquid across the tray against the upright web of the valve.

Personal Services, too, at the Bethlehem Supply Stores

Want to make a hurry-up phone call? Or leave a message? Or wait for the fellow who's driving you back to the lease?

If so, just remember—you're always welcome at the Bethlehem Supply store near you.

All through the oil country, men drop in for shop talk or a quick "hello" at our black-and-yellow stores. Here they pick up supplies they've ordered, pass the time of day, and ask about the call that's posted on the blackboard. Many of them make the Bethlehem store their regular meeting place.

There are now 51 of these clean, modern, well-kept stores in the Midcontinent, Rocky Mountain, Southwestern, and Pacific Coast fields. They are run by friendly people, and they are fully stocked to meet the local needs of the areas served. Drilling, production, refinery, or pipe-line equipment . . . the Bethlehem Supply store has it.

You'll like our stocks and the services we render, business and personal. Why not come in and get to know us —if you haven't already done so?

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM STEEL

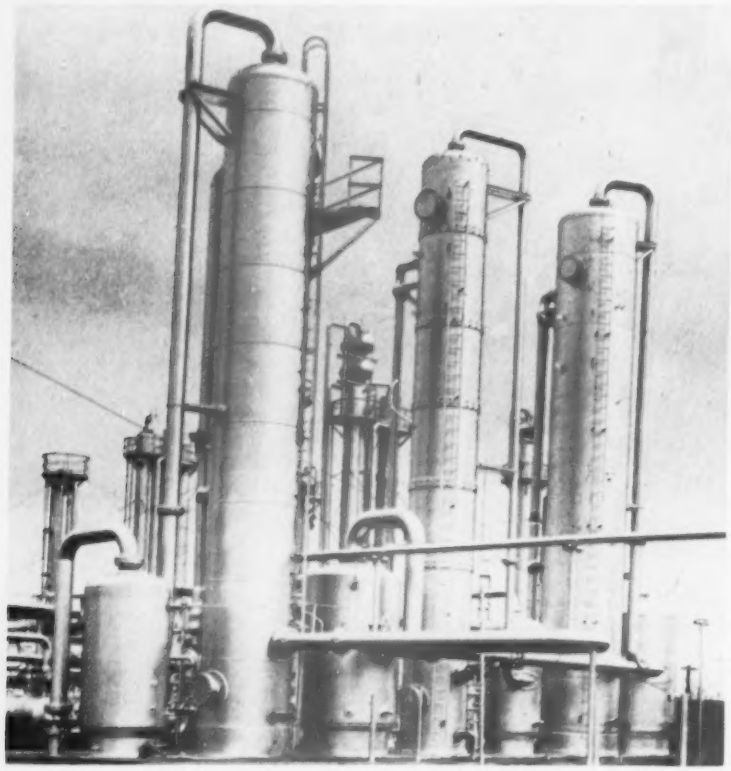


Fig. 5—A 70½-in.-i.d., 16-tray absorber used for test is on the left. Other two absorbers on right also equipped with float-valve trays.

Gas flow . . . The first small flow of gas brings the light edges of the row of valves adjacent to the exit weir into operation. As rate of gas flow increases the light edges of additional rows of valves, consecutively from their exit weir towards the entrance downcomer, are brought into operation. At approximately 20 per cent of design loading of the gas phase, irrespective of liquid loading, all the valves throughout the tray are brought into operation and full efficiency of the tray is realized. As rate of flow increases, additional loading occurs by increased differential through the openings of the light edges until at about 40 per cent of design loading the heavy edges start to rise. The gas emitting from the light sides of the valves urge the ends of the heavy edges of the valve snugly against the inside legs of the brackets and, also the upper edges of the light ends against the top of the inside of the brackets. Thus, any movement of the heavy edges is dampened by these contacts.

Furthermore, at the time all the light edges of the valves were brought into operation, any previously existing liquid gradient across the tray disappeared. Thus, as loading progresses beyond about 40 per cent, all the heavy edges of valves throughout the tray start opening in unison through their range of movement, and at about 70 per cent of loading all valves are in fully open position.

Beyond this point, full loading is accomplished by increased pressure drop through the valves in full open position. The stability of the functioning of the float valve has been observed during many tests, both on dry valves to develop capacity information and on a single commercial-size test tray operating on absorption oil and natural gas. Their stability is also manifest by the perfect condition of trays in a commercial tower observed on inspection after many months of operation.

Test and Operating Performance

Test facilities for measurement of all streams, sampling, and observation of temperatures and pressures have been provided on installations in absorption, distillation, and fractionation services.

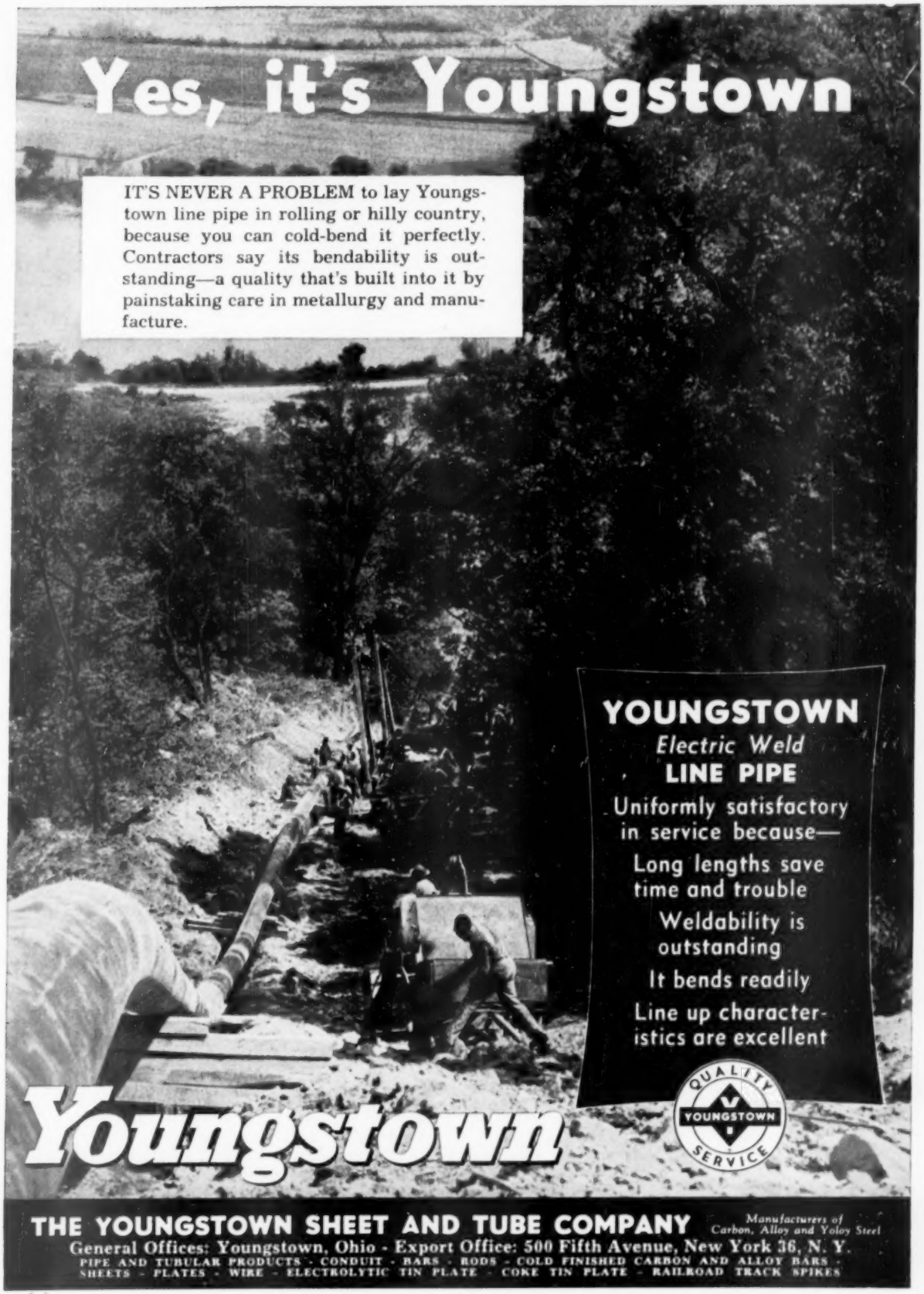
Absorbers . . . The first absorber, mentioned earlier, was equipped for testing and has been tested three different times. On the first test, only eight trays were used and were installed in the lower eight-tray positions with the absorption-oil inlet piped internally for normal entry on the top tray. Later, the top 8 trays were installed and two tests were conducted on the full 16-tray unit. This absorber is the left-hand tower in the photograph. Duplicate samples were carefully taken and analyzed. The observations and evaluations of these tests are shown in Table 1.

Although these tests were made with different numbers of trays and at a wide spread in loading, they show the tray performance to be remarkably the same. Operating performance in plants of three different companies in which all of the absorbers were changed over to float-valve trays show a reduced fixed gas retention for given product recoveries. In one of these plants, where a still, to be described later, was installed and the oil is completely stripped, there is no pentanes plus content in the outlet gas.

Calculations . . . In development of the summary results of Table 1, the actual per cent recoveries were calculated from the moles of entering gas determined from the analysis and its metered volume divided into the difference between same and the same evaluation of the outlet gas stream. The comparative per cents of theoretical recovery were based on an assumed 100 per cent tray efficiency by calculation, using Katz and Hackmuth equilibrium constants for the entering volume and quality of gas at observed conditions.

The analyses were somewhat erratic in the cut between iso and normal butanes but, since they are both in the key component range of extraction, they were grouped together for comparison between actual and theoretical recovery. Referring to Table 1, the actual recovery of butanes in the three tests is 98.25, 96.16, and 94.75 per cent, respectively, or an average of 96.39 per cent. A similar comparison of the total propane and heavier products is 97.91 per cent average for the three tests. It appears, therefore, that a tray efficiency in the range of 75 per cent is being attained.

Similar tests in the same plant on five original absorbers before the changeover gave 14 to 20 per cent efficiency on four of these towers and possibly 30 per cent on one of the towers. In this particular plant, the five absorbers consisted of two 7-ft.-diameter 12-tray, one 7-ft.-diameter 16-tray, one 6-ft.-diameter 16-tray (test tower), and one 5-ft.-diameter 16-tray towers, before the change over to float-valve trays. The latter three were equipped with these trays and the two


Yes, it's Youngstown
IT'S NEVER A PROBLEM to lay Youngstown line pipe in rolling or hilly country, because you can cold-bend it perfectly. Contractors say its bendability is outstanding—a quality that's built into it by painstaking care in metallurgy and manufacture.
YOUNGSTOWN
Electric Weld
LINE PIPE
Uniformly satisfactory in service because—
Long lengths save time and trouble
Weldability is outstanding
It bends readily
Line up characteristics are excellent
QUALITY
YOUNGSTOWN
SERVICE
Youngstown
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.
PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

7-ft.-diameter 12-tray towers were removed from absorption service. Although the original towers were more than ample for gas capacity, they were handling about all the oil they would take at an aggregate of 1,250,000 gal. daily. The present three towers appear to be able to handle about 50 per cent more gas loading than originally and are handling 1,785,000 gal. of oil daily.

First installation . . . This test absorber has been loaded to full gas capacity which was 51.3 million standard cubic feet per day, at which point the tower did not flood but frothed excessively. Upon load reduction of less than 1 per cent, stable operation resulted immediately. A study on the effect of oil rate on gas loading was made and it was found the above gas load could be handled at all oil rates used with identical results. This being the first tower to use float-valve trays, the trays were adapted to the existing downcomers. Also, this original tray layout was not equipped with nearly so many float-valve units as is now standard design. Where this installation carried only 110 valves with 7½ per cent downcomer area, present design permits the use of about 150. Thus, if excessive frothing is the result of slot velocity, then the prospect of appreciable increase in capacity rating is very favorable.

Other installations . . . Operating results of the three plants, where float-valve trays have replaced the former trays, have in all instances reflected product recoveries at least as good and apparently better than indicated by the above-described absorber tests. In all instances, the cross-sectional area of the towers left in service are about 50 per cent of that originally used and, in most instances, the extra towers have been utilized in other services. The present towers at each plant in aggregate are capable of handling more capacity of oil in combination with gas than could be handled with the original equipment.

Stills . . . The first installation of float-valve trays in a still, steam absorption-oil stripper in a natural-gasoline plant, was made in July 1953. This is a 6-ft. 6-in. i.d. tower with eight double-flow trays on 24-in. tray spacing and replaced two 6-ft. i.d. towers operating in parallel with six single-flow trays each. Table 2 is a summary of the test data and results showing available comparative data on the two old stills.

This tower was designed to handle 2¼ million gallons of lean oil daily but available oil-pump capacity has limited the loading to 1,970,000. A 100 per cent tray efficiency was assumed in design requiring 0.155 lb. of steam per gallon of oil at a temperature of 400° F. and 55 psia. The results show this performance to be accomplished. The levels of liquid stackup in the downcomers indicate the tower could easily

"Since the first commercial installation of float-valve bubble trays in 1951, a total of 27 installations have been made. Twenty of these are in service and the others will soon be operating."

TABLE 1—TEST OBSERVATIONS AND RESULTS ON A 6-FT.-DIAMETER ABSORBER EQUIPPED WITH 8 AND 16 FLOAT VALVE TRAYS ON 24-IN. SPACING

Operating conditions—	Test No. 1 October 22, 1951	Test No. 2 February 22, 1952	Test No. 3 April 26, 1952
No. of trays	8	16	16
Inlet gas, s.M.c.f./hr.	1,800.08	1,802.93	1,042.48
Outlet gas, s.M.c.f./hr.	1,686.68	1,689.19	979.66
Press. psia. base	242.13	233.04	200.84
Press. psia. top	240.73	230.44	199.14
Lean oil gal. hr. at 60° F.	18,504.40	21,117.62	14,773.48
Temperatures, °F.:			
Gas	In—92 Out—69	In—81 Out—60	In—78 Out—71
Oil	In—58 Out—91	In—52 Out—83	In—64 Out—84
Specific gravities:			
Gas	In—0.696 Out—0.656	In—0.692 Out—0.643	In—0.695 Out—0.652
Lean oil	0.8212	0.8200	0.8100
Mol. wt. of oil	216	216	205
Per Cent Test Recoveries of Products as Compared to Theoretical Recovery With Assumed 100 Per Cent Tray Efficiency			
Propane	98.77	95.24	113.23
Isobutane	101.28	112.97	84.10
Normal butane	97.01	90.62	97.76
Butanes grouped	(98.25)	(96.16)	(94.75)
Pentanes plus	96.81	96.88	92.35
Moles propane plus recovered/hr.	97.96	96.05	99.74

TABLE 2—SUMMARY OF TEST RESULTS ON A 6½-FT.-DIAMETER STILL EQUIPPED WITH EIGHT DOUBLE-FLOW FLOAT VALVE TRAYS ON 24-IN. SPACING AND COMPARATIVE RESULTS IN PART FOR TWO 6-FT.-DIAMETER STILLS OPERATED IN PARALLEL AND REPLACED BY NEW FLOAT-VALVE TRAY STILL

Item—	New still	Old stills
Date of test	9-23-53	No actual test
Oil cir. gal./day	1,969,607	1,800,000
Stripping steam, lb. per day	303,120	552,000
Lb. steam/gal. oil	0.1539	0.3065
I.b.p. lean oil, °F.	444	360-385
Per cent over at 400° F.	0	0.3-0.5
Per cent sat. by CO_2 method	0.26	Not run
Gasoline hydrocarbons passing still—moles per day:		
(a) Liquid feed to deethanizer	8,727	No test data
(b) Vapor recycle to demethanizer	4,222	No test data
Reflux oil return from deph., g.p.m.	30.16	Approx. 60
Pressure, psia. base	55.2	Not tested
Pressure, psia. top	54.25	Approx. same
Oil entering, °F.	395	403
Oil leaving, °F.	387	400
Stripping steam, °F.	387	Approx. same
Steam superheat, °F.	77	Approx. same
Liquid levels in downcomers above top of entering tray decks. (Exit weirs—1⅞ in. high):		
(a) Above No. 1 tray (bottom tray), in.	8	No data
(b) Above No. 2 tray, in.	8⅜	No data
(c) Above No. 5 tray (probably error), in.	7⅜	No data
(d) Above No. 7 tray, in.	8¾	No data
Mol. wt. of oil in system, approx.	216	210
A.P.I. of oil in system	40.7	41.5
Mol. wt. of charge (new) oil	180	180
A.P.I. of charge oil	42	42
Approx. I.b.p. charge oil, °F.	415	415
Approx. e.p. charge oil, °F.	520	520

UNIFORMITY

UNIFORM IN SIZE AND FINISH
UNIFORM IN PRECISION THREADING
UNIFORM IN LASTING SERVICE

W.C. NORRIS, MANUFACTURER, INC.

TULSA, OKLAHOMA

WEST COAST DISTRIBUTORS:
REPUBLIC SUPPLY COMPANY OF CALIFORNIA,
Los Angeles

BRANCHES:
HOUSTON, KILGORE, ODESSA, TEXAS;
SALEM, ILLINOIS, CASPER, WYOMING
EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

added reason to—

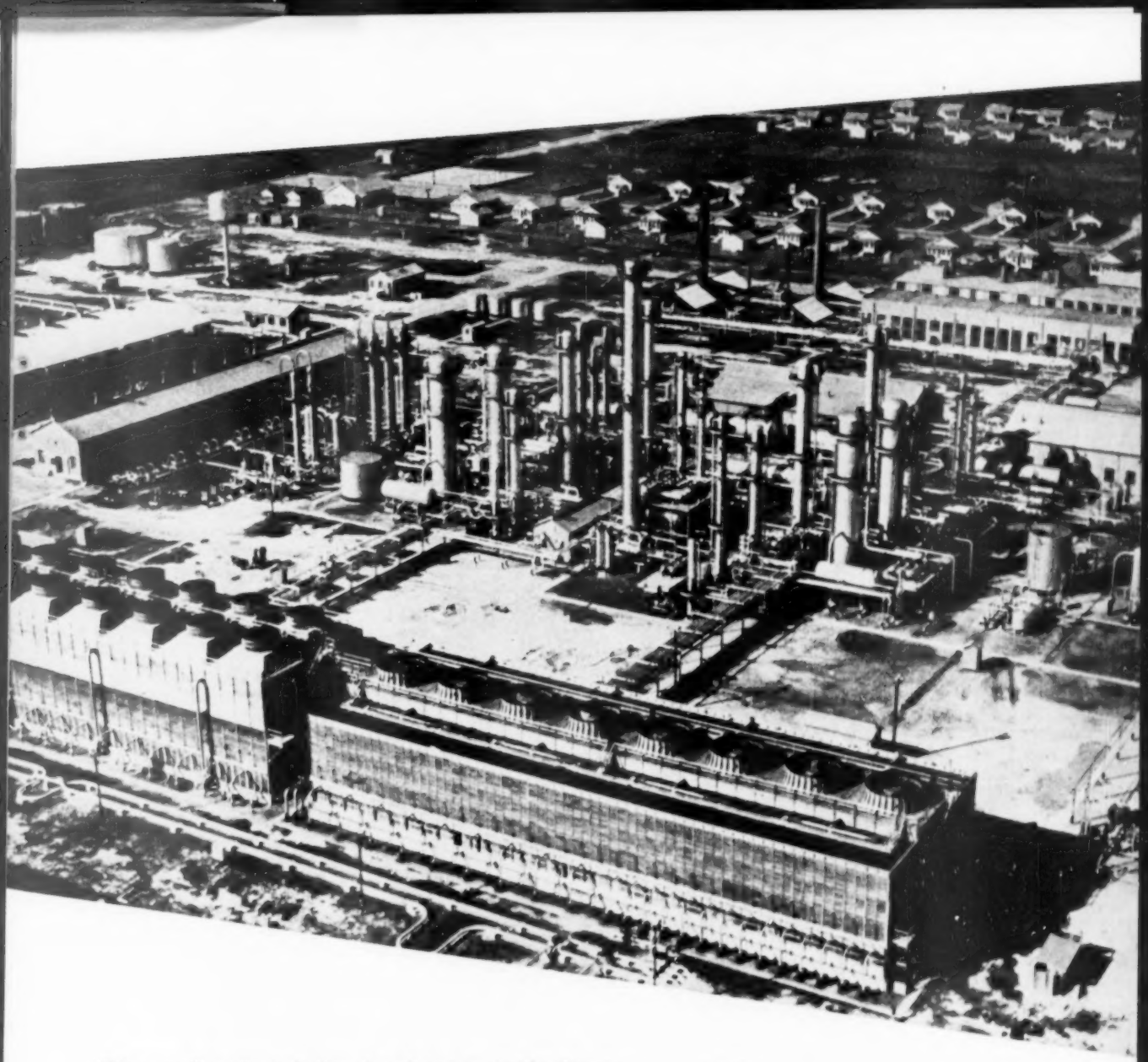
Take it up with Stearns-Roger

Moving into its new Home Office building, designed and constructed by Stearns-Roger to its own requirements, this Company improves substantially its ability to serve a fast-developing America.

In this one L-shaped building (with 90,000 square feet of floor space and capable of future expansion) every modern facility is provided for more than 500 executives, engineers, draftsmen, and office personnel.

Stearns-Roger construction crews are continuously at work on a long list of projects located in many states, the value of which totals many millions of dollars. From its Denver shops, special equipment totalling many trainloads rolls out annually to virtually every state in the Union and to many foreign countries.

For nearly three quarters of a century . . . the power, mining, metallurgical, chemical, sugar, and gas & oil industries have learned that it pays to "TAKE IT UP WITH STEARNS-ROGER" . . . whether the requirement is a complete new plant, or enlargement or modernization of existing plants.



This recycling plant, designed and constructed by Stearns-Roger, is the largest gas processing plant in the industry and is owned by 33 separate interests, including 13 major companies.

It processes well over 500 million cu. ft. of gas per day. Absorbers operate at 1800 p.s.i. and treated gas is re-compressed to 3500 p.s.i. for return to producing formations. Much of the equipment, manufactured in our Denver shops, was limited in size only by railroad weight and clearance limits to the plant site.

ENGINEERS

DESIGNERS

MANUFACTURERS

CONSTRUCTORS

Stearns-Roger

THE STEARNS-ROGER MFG CO. DENVER, COLORADO

DENVER • HOUSTON

EL PASO • SALT LAKE CITY

handle the 2¼ million gallons of circulation at 90 per cent of flood-point loading.

This still is handling twice the load per square foot of cross-section and using half the stripping steam in comparison to the old stills. Most important, it is throughly stripping the oil, whereas the old stills were leaving an undesirable per cent of saturation in the oil.

Fractionators . . . The first installation of float-valve trays in a fractionator was also made in July 1953. This is a 4-ft. 6-in. i.d. depropanizer with 30 trays on 18-in. tray spacing. The piping was installed so the tower could be operated with the full 30 trays, or could be refluxed and operated on 14, 16, or 18 trays (the regular alternate feed entries) with feed points lowered to alternate points on trays 4, 6, and 8.

Two tests using 30 trays in one instance and 18 trays in the other have been conducted but because of mechanical trouble and poor measurement, the results are not presented. Time since has not permitted additional testing.

The tower operates very smoothly and abrupt changes in feed or reflux rates are not reflected on the temperature or pressure-recording controller charts. The maximum loading ever placed on the tower was during the 18-tray test when 1,085 moles per hour of combined reflux and overhead vapors, representing an 8.63 to 1 reflux ratio, were handled in the fractiopation section. At this time the tower was operating at 263 psia. and 127° F. top temperature. The overhead contained 2.3 per cent isobutane and the base product 0.90 per cent propane. There was no indication of being close to a flooding load although the liquid in the gage glasses on the downcomers was standing 9 in. above tray deck level, or one-half the distance between trays.

This tower currently operates on 30 trays and as an average with a feed of 3,700, base product of 2,350, overhead product of 1,350, and reflux of 7,225 gal. per hour. The operating pressure is 263 psia. and the top temperature 127° F. The reflux noted is a ratio of 5.35 to 1 against the overhead propane production. Frequent control analyses show the propane to contain 1.0 per cent isobutane and the base product to contain 0.7 per cent propane as an average. These results reflect at least 20 per cent more effective fractionation per tray and capacity than was being accomplished with two 36-in. i.d. 30-tray towers operated in parallel in this same service previous to this installation.

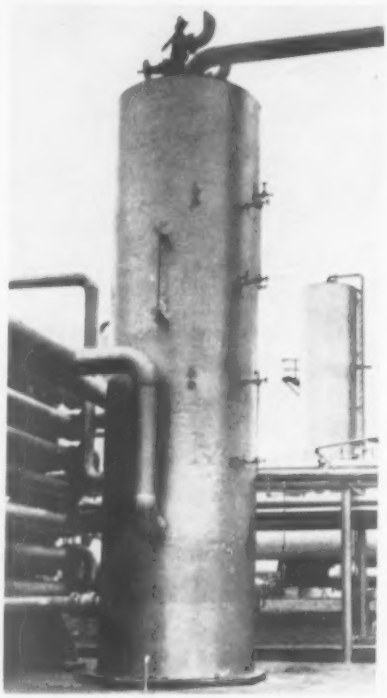


Fig. 6—This is 6½-ft.-diameter, eight-tray still used for test.

Butane splitter . . . Of interest is a 3-ft. i.d., 46-tray butane splitter with 21-in. tray spacing put into operation in late October 1953, producing isobutane with 1.8 per cent normal-butane contamination and normal butane with 3.2 per cent isobutane contamination. The reflux ratio to overhead is 23.6 to 1 and represents a vapor load in the fractionation section of tower of 505 moles per hour. The tower operates at 125 psia. pressure with a top temperature of 134° F.

Demethanizer stripper . . . A rich-oil demethanizer stripper was equipped with float-valve bubble trays. This stripper is an old 7-ft. 12-tray absorber in which the downcomers, of single-flow type, were enlarged when the float-valve trays were installed. This tower is handling a rich-oil volume of approximately 2,100,000 gal. daily, or about 1,460 g.p.m. A volume of 1,600 M.c.f. daily of vapor recycle off the raw product accumulator is introduced into the bottom of this tower as a stripping agent. Although no tests have been made on this system, operating results indicate it is more than meeting design requirements.

Commercial Installations

Since the first commercial installation of float-valve bubble trays in an absorber in September 1951, a total of 27 installations have been made. Twenty of these installations are in service and the others will soon be operating. Of these installations, there are 10 absorbers, 4 reabsorbers, and 2 each of fractionators, stills, and rich-oil demethanizers. These installations have been made to 11 companies. All jobs have fully met performance recommendations.

It is quite evident from the experience factor on these trays that appreciable increased efficiency and capacity have been realized over conventional trays now in general use. These trays are simple and durable in construction, are easy to handle and install, are highly efficient over wide loading ranges, and have many other merits, several of which are summarized as follows:

1. Efficiency constant over wide operating range due to uniform distribution of gas and liquid forced by low valve pressure differential produced by float valves.

2. Energy of gas passing "float valves," in narrow ribbons at tray level utilized for intimate contact.

3. Time contact at maximum because of lateral high velocity impingement at tray level.

4. Mist and entrainment to tray above at minimum due to uniform blanket of frothy liquid on tray.

5. Liquid gradient across tray is at minimum because of no high obstructions on tray floor and, in fact, disappears above 20 per cent loading.

6. Liquid cannot short-circuit tray at any operating rate and exit weirs seal downcomers from opposite side of tray.

7. Liquid capacity high due to no obstruction at tray entrance and across tray.

8. Interruptions of either gas or liquid flow may be restored without adjustment of flow of other medium.

9. Fouling is minimized due to active operation throughout tray at all capacities.

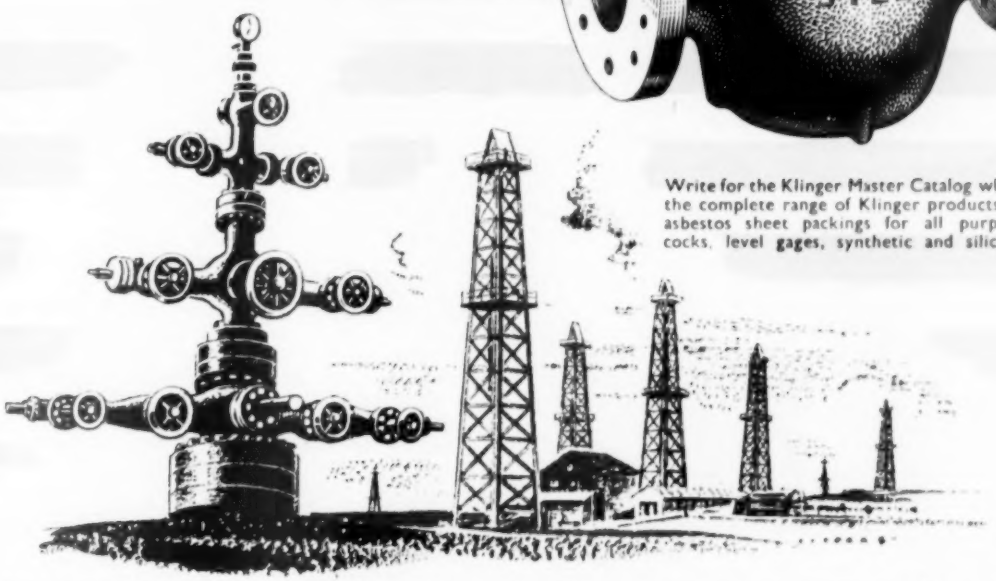
10. Installation readily applicable to existing towers and downcomers in either removable or fixed tray equipment.

11. Light weight yet extremely sturdy and price economical including stainless-steel trim.

12. Design and engineering simple and positive, thus risk or hazard of improper design eliminated.

INSTALL KLINGER VALVES

Klingerise your plant



Write for the Klinger Master Catalog which describes the complete range of Klinger products, compressed asbestos sheet packings for all purposes, valves, cocks, level gages, synthetic and silicone rubbers.

RICHARD KLINGER LIMITED, KLINGERIT WORKS, SIDCUP, KENT, ENGLAND

Manufacturing Licensees for Canada — Agents throughout the World — Manufacturing Licensees for U.S.A.

JOSEPH ROBB & COMPANY, LIMITED
5575, COTE ST. PAUL ROAD, MONTREAL, 20, CANADA
Telephone: WILBANK 3181 Cable: ROBCO
Branches at: SYDNEY, N.S., HALIFAX, N.S., OTTAWA, Ont., TORONTO, Ont., HAMILTON, Ont., WINNIPEG, Man., EDMONTON, Alta., VANCOUVER, B.C.

THE KLINGER CORPORATION OF AMERICA
95, RIVER STREET, HOBOKEN, NEW JERSEY, U.S.A.
Telephone: HOBOKEN 2-7915 Cable: KLINGDALE
New York Office: 17, BATTERY PLACE, NEW YORK 4, N.Y., U.S.A.
Telephone: WHITEHALL 3-8996 Cable: COFFDALE

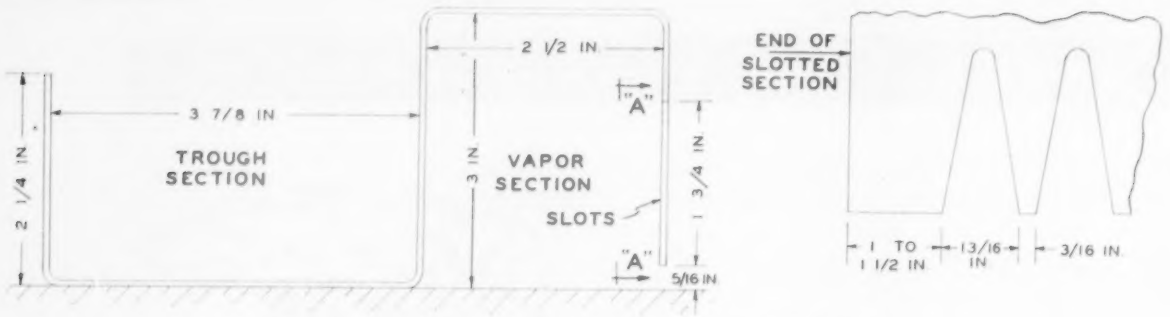


Fig. 1—"S" member is fundamental unit of Socony-Vacuum Uniflux tray.

6. SOCONY UNIFLUX . . .

Simple, Adaptable to Standardization, Inexpensive—"S" Member Is Basic Unit of This Fractionating Tray

by V. O. Bowles

OVER the past two decades the experience of Socony-Vacuum Oil Co., Inc., with fractionating trays has been almost exclusively with trays of the bubble-cap type. During this period Socony has left the problems of rating and designing trays almost entirely in the hands of engineer-contractors and has made little attempt to develop specifications for, or standarize on bubble-cap tray designs. Consequently to protect continuity of operation, it has been necessary to warehouse a great variety of bubble caps and tray parts, with resultant high inventory cost for large stocks which are turned over very slowly.

It has been the experience of Socony that fractionators have been generally operated ultimately at rates substantially in excess of original design rates and only rarely has it been considered expedient to replace, or even significantly alter any trays. Furthermore, the fractionating efficiency of bubble-cap trays appears to hold up remarkably well, even at rates of 40 to 70 per cent in excess of original design rates. Additionally, experience indicates that the ultimate capacity of bubble-cap trays is more often limited by downflow restriction than any other cause. There is reason to believe that in some fractionators where conditions of high downflow exist, fractionating efficiency is not all it should be, because of excessive hydraulic gradient and resultant unequal slot submergence.

Author is with Socony-Vacuum Oil Co., Inc., refinery engineering division, New York City.

Bubble caps most common . . . While over the years there have been some notable innovations in fractionating tray design, no new or improved design has yet been offered that has received wide general acceptance. Bubble-cap trays are still by far the most commonly employed fractionating trays today and probably will be for at least some time to come. This is remarkable when one considers that there has been no such significant improvement in bubble-cap trays during the past 15 years, and that this type of tray can be fabricated and installed more cheaply today than 15 years ago (disregarding the effect of inflation). It is not intended to deny that there have been improvements, because it is recognized that fabricators have bent considerable effort to this end and certainly with some success. On the other hand, it is possible that more stringent requirements and specifications of process designers have tended to nullify such gains.

Uniflux tray . . . Socony engineers have, along with other operators and designers of fractionating equipment, devoted considerable attention to the development and improvement of fractionating tray design over the past several years. The result has been the development of Uniflux fractionating tray. The Socony approach to this problem has been not to develop a radically new and different vapor-liquid contacting device, but to develop a tray employing the same general principles as bubble-cap trays which correct some of the faults in conventional bubble-cap tray design and at the same time is simple, adaptable to standardization, and inexpensive.

Socony Uniflux type fractionating trays perform in substantially the same manner and have many of the same characteristics as conventional bubble-cap trays. Since the design of these trays combines functional and mechanical features, the tray is light in weight and therefore less expensive than comparable bubble-cap trays. It is of simple design and can be rapidly installed in fractionating towers and easily removed if necessary for maintenance inspection and cleaning.

S Member

The fundamental unit of the Uniflux tray is an S member (see Fig. 1). The vapor section of each S member is enclosed at each end by vapor-closure pieces. Intermediate stiffeners are fastened at specified intervals in the trough section, to insure a good section modulus to the member, especially to the free wall of the trough section. These vapor-closure pieces and tray stiffeners are slotted so that on assembly the S members are imbricated as shown in Fig. 2. Thus the basic S member has structural, as well as functional properties. When fabricated of 16-gage material, it has ample strength to span a 10-ft.-diameter tower with negligible de-

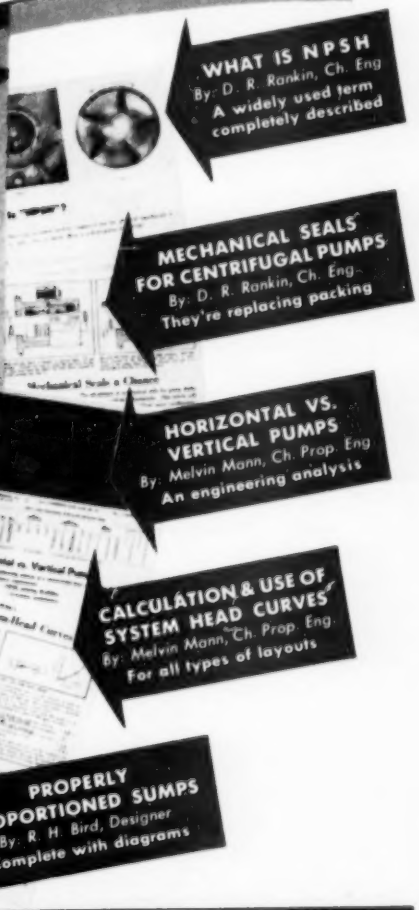
PEERLESS PUMPS

FREE TECHNICAL PAPERS & ARTICLES

OF VALUE TO PUMP ENGINEERS & OPERATORS

technical papers

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
LOS ANGELES • INDIANAPOLIS


WHAT IS NPSH
By: D. R. Rankin, Ch. Eng.
A widely used term completely described
MECHANICAL SEALS FOR CENTRIFUGAL PUMPS
By: D. R. Rankin, Ch. Eng.
They're replacing packing
HORIZONTAL VS. VERTICAL PUMPS
By: Melvin Mann, Ch. Prop. Eng.
An engineering analysis
CALCULATION & USE OF SYSTEM HEAD CURVES
By: Melvin Mann, Ch. Prop. Eng.
For all types of layouts
PROPERLY PROPORTIONED SUMPS
By: R. H. Bird, Designer
Complete with diagrams

NEWLY PUBLISHED DATA BY PEERLESS PUMP ENGINEERS NOW AVAILABLE IN CONVENIENT FILE SIZE FORM

The technical papers titled and illustrated are republished articles, authored by Peerless Pump engineering personnel, which were printed in recent copies of leading trade journals. They contain a wealth of authentic, useful, practical, illustrative and descriptive information on pumps and allied subjects that you can use in buying or applying pumps. The five articles shown are available individually or together, bound into the file-size cover shown above. Use the coupon at the right to request the articles you want. They will be mailed free from Peerless Pumps—manufacturers of one of the broadest lines of horizontal and vertical pump lines for industrial and commercial application.

MAIL THIS COUPON FOR BULLETINS YOU WANT

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
301 West Avenue 26, Los Angeles 31, California

Please send reprints checked below:

☐ WHAT IS NPSH ☐ HORIZONTAL VS. VERTICAL PUMPS ☐ MECHANICAL SEALS
☐ SUMP DESIGNS ☐ SYSTEM HEAD CURVES

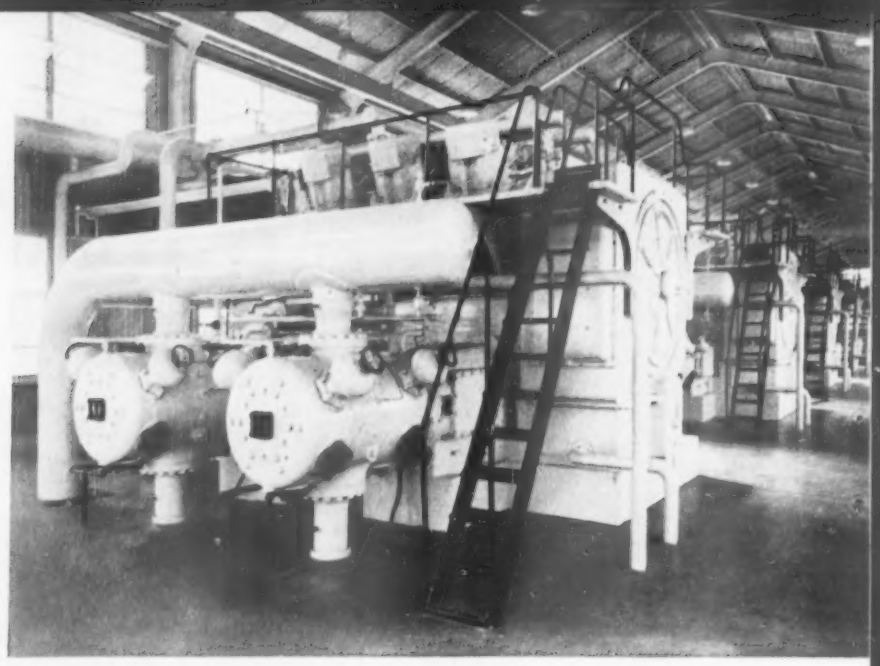
NAME _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

O&G]

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION

Plants: Indianapolis, Indiana • Los Angeles, California
Offices: New York; Indianapolis; Chicago; St. Louis; Atlanta; Dallas, Plainview and Lubbock, Texas; Fresno; Los Angeles; Phoenix; Albuquerque

Another Example of Efficient Power at Lower Cost



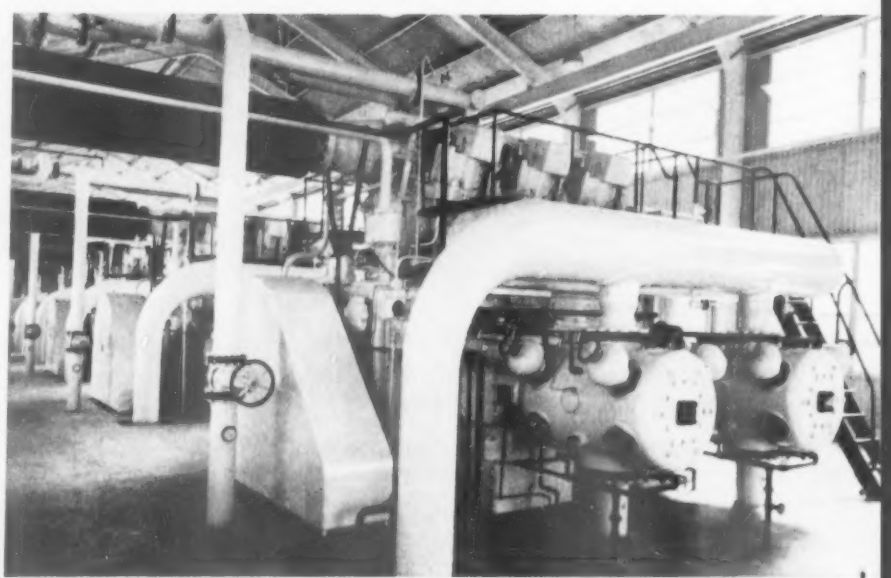
How **Cooper-Bessemers** *help United Gas serve the Gulf South*

COMPRESSOR station engineers of United Gas — world's largest handler of natural gas with a System capacity of more than four billion cubic feet a day—know what long-lasting, dependable Cooper-Bessemer compressors can do. Many Cooper-Bessemer installations on the United system are in daily service after as much as twenty-eight years of continuous operation.

Cooper-Bessemer GMW compressors, totaling 34,000 horsepower of additional capacity, were installed by United Gas Pipe Line Company during its multi-million dollar expansion program started in 1951

Reliable Cooper-Bessemer units now operating on the United Gas System total 88,845 horsepower.

Throughout the South and throughout the world — wherever top performance is demanded — you will find smooth-working, compact Cooper-Bessemer units. If you are searching for efficient compressors offering increased profits and reduced operating costs, check with your nearest Cooper-Bessemer office.



Line-up of Cooper-Bessemer GMW V-angles on United Gas Pipe Line Company's two largest compressor stations, the Edna No. 2 (top) and Refugio stations. Each station has eight 1500 hp GMW-6's totaling 12,000 horsepower per station. With separate jacket water pumps and magneto ignition systems, these modern V-angles can operate independently and are further equipped with automatic shutdown controls.

MOUNT VERNON, OHIO

COOPER-BESSEMER

GROVE CITY, PENNA.

New York City Washington, D.C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas
Seattle, Wash. Shreveport, La. St. Louis, Mo. Los Angeles, Calif. Gloucester, Mass. Tulsa, Okla. New Orleans, La.
Cooper-Bessemer of Canada, Ltd., Edmonton, Alberta — Halifax, Nova Scotia

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS • HIGH PRESSURE LIQUID PUMPS

"Equal slot submergence and elimination of areas of interference will result in performance advantages."

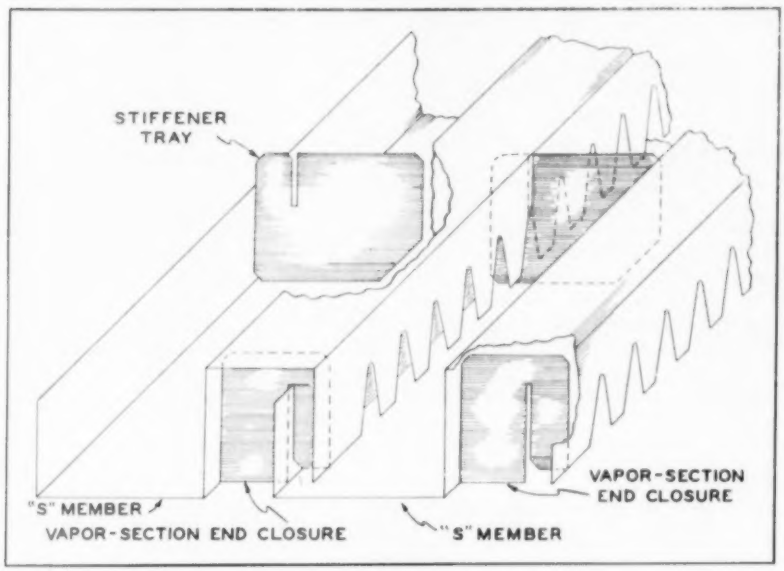


Fig. 2—Graphic view of typical Uniflux tray sections.

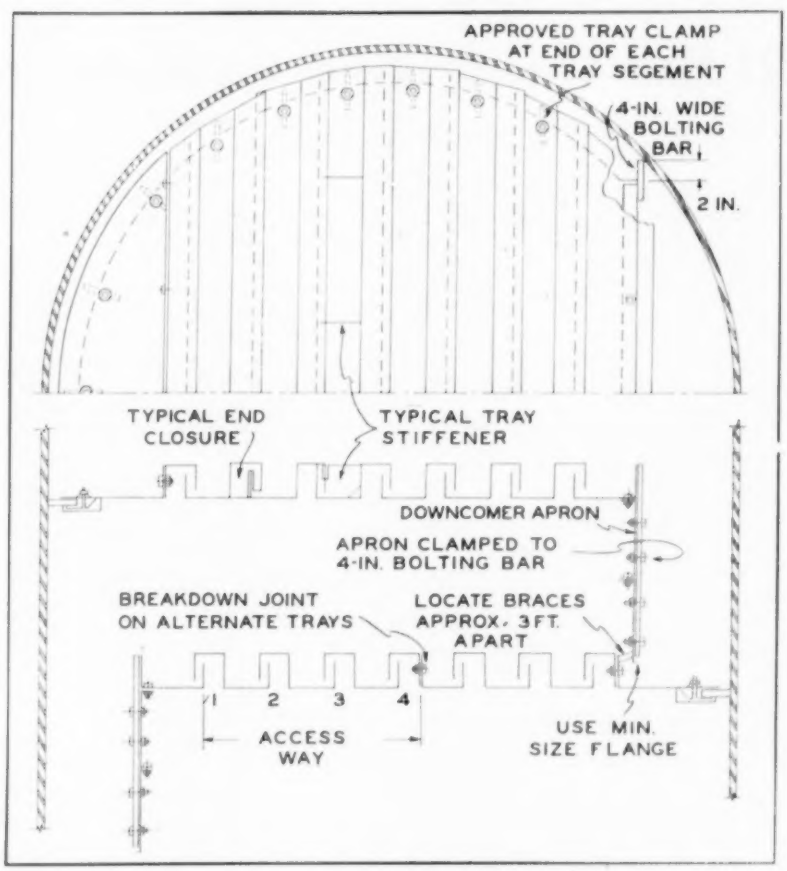

APPROVED TRAY CLAMP AT END OF EACH TRAY SEGEMENT
4-IN. WIDE BOLTING BAR
2 IN.
TYPICAL END CLOSURE
TYPICAL TRAY STIFFENER
DOWNCOMER APRON
APRON CLAMPED TO 4-IN. BOLTING BAR
BREAKDOWN JOINT ON ALTERNATE TRAYS
LOCATE BRACES APPROX. 3 FT. APART
1 2 3 4
ACCESS WAY
USE MIN. SIZE FLANGE

Fig. 3—Assembly plan and elevation for single cross flow tray.

flection under operating and maintenance conditions. In larger towers (up to 20-ft. diameter) a single intermediate support beam is used. No other support beams or purlins are required.

Assembly . . . These S members are secured to conventional support rings by a single conventional tray clamp at each end. The general assembly of a single cross flow Uniflux tray may be seen in Fig. 3. It may be seen that the S members are assembled starting from the trough at the downstream side of the tray. The last vapor section is fastened to the vertical flange which is a part of the segmental section at the foot of the downcomer.

For trays having more than seven S members, a split S member is provided on alternate trays so that vertical access is provided for maintenance, cleaning, and inspection. Downcomers are similar to those of conventional bubble-cap trays, except that they are standardized with Uniflux trays and are so designed that unrestricted downflow is insured. For trays of very large downflow requirements the vertical flange of the segmental section at the inlet side of the tray is extended upward to provide a proper seal for the downcomer at the inlet to the tray. Double crossflow trays employ the same basic S member elements and are of similar design to the single crossflow design just described.

Slot area . . . The tray parts are so proportioned that the available slot area is about 12 to 14 per cent of the superficial tower area, or generally equivalent to that provided in conventional bubble-cap tray designs. Since the slotted sections are well separated, there is no interference of the vapors issuing from one slotted element with those issuing from another and the entire length of the slotted sections is fully effective. Furthermore, the vapors issue forth in one direction and in such a manner as to boost the liquid across the tray and compensate for hydraulic gradient under all conditions of flow. Therefore, running slot submergence is uniform across the tray.

Riser area . . . This in general averages 2 to 4 times the riser area provided in bubble-cap tray designs. Likewise, reversal area and equivalent annular area are large. Therefore, the Uniflux tray is characterized by a lower fixed pressure drop (exclusive of that due to slot submergence) than bubble-cap trays. From data developed to date with the Uniflux tray it appears evident that

the combination of equal slot submergence (compensated hydraulic gradient), low pressure drop and elimination of areas of interference will result in measurable performance advantages.

Fabrication . . . Socony Uniflux trays fabricated of 16-gage material, complete with downcomers, weigh about 8 lb. per sq. ft. of superficial tower area. Fabrication is very simple and can be accomplished with standard press brakes, shears, and die-stamping equipment found in many light-metal shops. Thus the Uniflux tray is very inexpensive. Experience in the purchase of a large number of these trays indicates costs in the range of 60 per cent of the cost of conventional bubble-cap trays of similar alloy.

Uniflux in Service

Uniflux fractionating trays have been in service on catalytic cracking facilities at the refinery of Socony-Vacuum Francaise in southern France. The applications at this refinery include the feed-preparation towers, the reactor effluent fractionator and its strippers, the amine absorption system, hydrocarbon absorber, debutanizer, and a side-stream stripper for recovering butane cut from the debutanizer. This catalytic cracking unit has a capacity of approximately 17,500 bbl. per day.

The fractionating equipment has performed in a completely satisfactory manner from the start. While fractionation is considered to have exceeded expectations, it would be premature to attach any quantitative efficiency or capacity advantage on the basis of the data that have been secured to date. The management in France is especially impressed by the low cost of installation of these trays and by the very low maintenance requirement since operations started.

Developing specifications . . . In the United States, design development has been under way in cooperation with tray fabricators, aimed largely at the development of a uniform set of specifications for the Socony Uniflux fractionating tray. At present Uniflux fractionating trays are being planned for more than 100 fractionating-tower installations in the United States and abroad, including the entire fractionating-tray requirements for two complete refineries. It is expected that soon a sufficient amount of reliable information will be available to more quantitatively assess the anticipated performance advantages of the Uniflux fractionating tray. In the meantime, Socony-Vacuum has taken the position that these trays are extraordinarily inexpensive and that on the basis of merely equivalent performance very substantial savings in capital outlay have been realized.

The problem of warehousing spare parts for Socony Uniflux trays is quite simple and very inexpensive. For example, if Uniflux trays are being used in an entire new refinery, it is merely necessary to have on hand an appropriate number of S members approximately 10 ft. long and a suitable supply of vapor-closure pieces and tray stiffeners. A suitable stock of 16-gage flat plate can be provided for downcomer aprons, seal pans, and other miscellaneous tray parts.

Licensing . . . Consistent with Socony-Vacuum policy the Uniflux fractionating tray is being made available to the petroleum and chemical industry on the basis of a modest fee of $1.00 per sq. ft. of superficial tower area per tray. In actual practice fabricators will be licensed to construct Socony Uniflux fractionating trays and this fee will be included in the tray quotation by the fabricator. At the present time four fabricators of fractionating trays are in a position to furnish quotations in the United States and one fabricator in France. The information necessary for fabricators to build these trays will be made available to other firms on request. Rating of trays will be provided by the refinery engineering division of Socony-Vacuum, at the request of either engineer contractors or the ultimate users. Such requests are usually processed in a matter of a few days, even though they might include the entire tray requirements for a complete processing unit, or an entire refinery.

7. GULF'S PERFORATED PLATE...

Now Operating in 35 Towers, With 21 More Currently Under Construction

by A. C. Eld

THE Gulf-designed perforated-plate-type tray has been in operation in Gulf Oil Corp. refineries for the past 14 years.

It has been installed in towers, ranging in diameter from 2 ft.-8-in. to 10-ft. with tray spacing from 18 to 30 in. A tower of 13-ft. diameter with 36-in. tray spacing is about ready to be put into operation.

The tower pressures range from substantially atmospheric to 650 psig.

Thirty-five towers equipped with Gulf perforated-plate-type trays are now operating, and an additional twenty-one towers are being built, most of which are scheduled to be operating within a year.

The Gulf perforated-plate-type tray is a high-tray-spacing type tray (tray spacings above 18 in.) in contrast to the sieve-type tray, which is designed and built by several other corporations as a low-tray-spacing-type tray (tray spacings less than 18 in.).

The two types or groups of trays are different in design and in operation.

Bubble-cap-type trays may also be classified as low and high-tray-spacing-type trays, which also are different in design and operation.

Fig. 1 illustates a low-tray-spacing cap-type tray. This is the type of tray that most often is found in text books. A definite depth of liquid is established and maintained on the tray, and the vapor, passing through the riser, reversal, and the annular areas merely bubbles through the slots, and the liquids on the tray.

Fig. 2 illustrates a high-tray-spacing cap-type tray. The vapor passes through the various riser and cap areas, and the slots, with a considerably higher vapor velocity than is the the case for the low-tray-spacing cap-type tray. The vapor velocity is sufficient to push the liquid up into the space between the trays, so that the liquid that is charged to the tray through the downflow from the tray above, is immediately picked up by the vapor rising from the disengaging areas.

The liquid is held in suspension in the form of droplets above the tray as it flows from the inlet to the outlet side of the tray. The slots are merely used for distribution of the vapor. The actual

Author is with Gulf Oil Corp., Pittsburgh.

INCREASE throughput capacity
ELIMINATE costly liquid loss
IMPROVE overhead product quality
REDUCE harmful air pollution
with

YORKMESH DeMISTERS

CASE STUDY NO. 1002

CATALYST POISONING REDUCED 90%

OBJECTIVE:
To maintain high catalyst activity and increase catalyst life in the cracking unit by eliminating metal contamination due to liquid entrainment in the vacuum tower.

PROBLEM:
Excessive amounts of vanadium and nickel were being entrained in the vacuum tower overhead and sidedraw streams. When these gas oils were fed to the cat cracking units, the life of the catalyst was materially shortened. This meant high catalyst circulation rates, excessive attrition and greater catalyst make up. Deposition of metals also caused periodic drops in product yields; a reduction of 60% in butanes and butenes and 20% in gasoline yields was experienced on occasions. Accompanying increased rate of carbon build up on the catalyst particles at the same time made regeneration more difficult.

SOLUTION:
A 4" thick type 316 stainless steel Yorkmesh Demister installed two feet below the sidedraw accumulating channel eliminated the contaminating liquid entrainment.

RESULTS:
Metal contamination was reduced by over 90% and catalyst life was substantially extended.

COMPARISON OF METALS CONTENT BEFORE AND AFTER INSTALLATION OF YORKMESH DEMISTER

Sidedraw Stream (Ppm)	Before	After
Vanadium	30	3
Nickel	28	3
Ash	136	9.6
Overhead Stream (Ppm)	**Before**	**After**
Vanadium	2.0	0.09
Nickel	2.0	0.03
Ash	18	4.3

Note: For full story of how this single 4" Yorkmesh Demister pad reduced metal contamination by over 90% write for case study No. 1002

YORK

OTTO H. YORK CO., INC.
69 GLENWOOD PLACE, EAST ORANGE, N.J.

Why YOU CAN DEPEND ON **ANCHOR** WHEN NATURAL GASOLINE FIGURES IN YOUR BUSINESS

Ample Supplies

If you want to buy Natural Gasoline, Anchor can promise to meet your needs under a year-round contract plan. Our plants have been increased so that we may take care of more and more contract customers.

Transportation Facilities

The Anchor fleet of tank cars, now one of the largest hauling Natural Gasoline, is being constantly expanded to assure you of dependable deliveries. In addition, our trucking facilities are sufficient to take care of any area where rail transportation is not practical.

Ample In Experience

Anchor personnel is experienced in the needs of Natural Gasoline users and refiners. That experience is applied in your best interest. Whether you wish to buy or sell Natural Gasoline, contact Anchor. You'll like your treatment, and we'd like to hear from you. Phone 2-7261, Tulsa.

ANCHOR *"Merchants of Petroleum Products"*
PETROLEUM COMPANY • TULSA

SALES OFFICES: DES MOINES • OMAHA • TOLEDO • HOUSTON • LOS ANGELES
ATLANTA • WESTFIELD, MASS. • MIDLAND, TEXAS

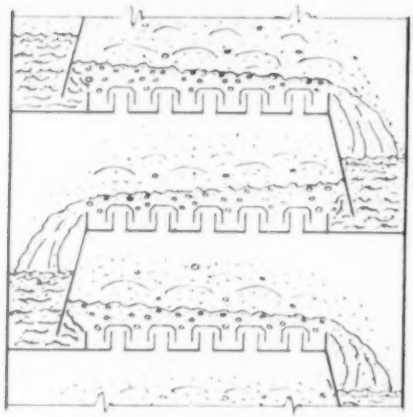


Fig. 1—Low-tray-spacing cap-type tray most often shown in text books.

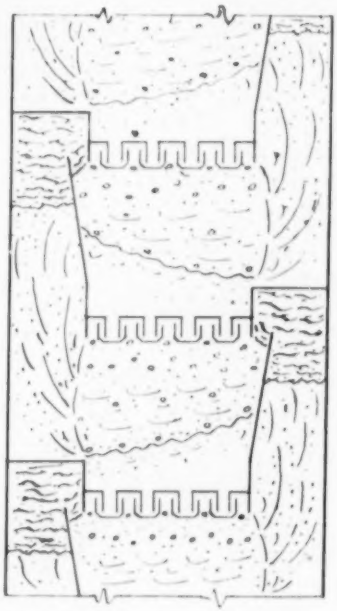


Fig. 2—High-tray-spacing cap-type tray has higher vapor velocity.

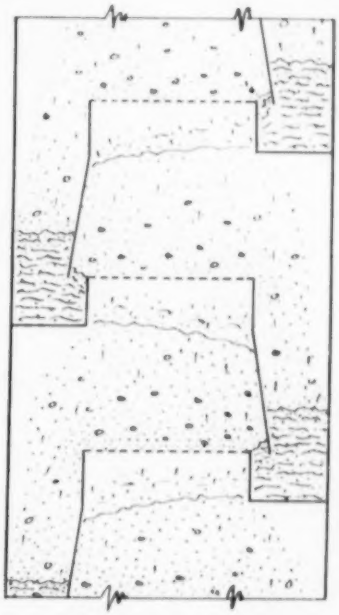


Fig. 4—Gulf perforated-plate-type tray, high tray spacing, for which weirs are not required.

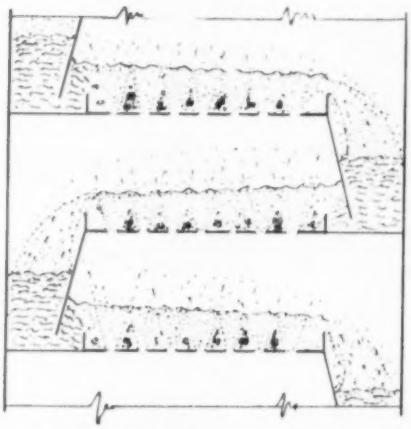


Fig. 3—Sieve-type tray, low tray spacing, on which more or less violent boiling action occurs.

release of the vapor takes place in the disengaging area, and the cap spacing and shape should be designed accordingly. Fig. 5 shows a typical Gulf cap layout.

Fig. 3 illustrates a low-tray-spacing perforated-plate-type tray. This tray design is based on a theory similar to that used for the low-tray-spacing cap-type tray, namely, that a definite volume of liquid is kept on the tray, and the vapor merely bubbles through the liquid, causing more or less violent boiling action of the liquid. Quieting zones are provided at inlet and outlet of the vapor area.

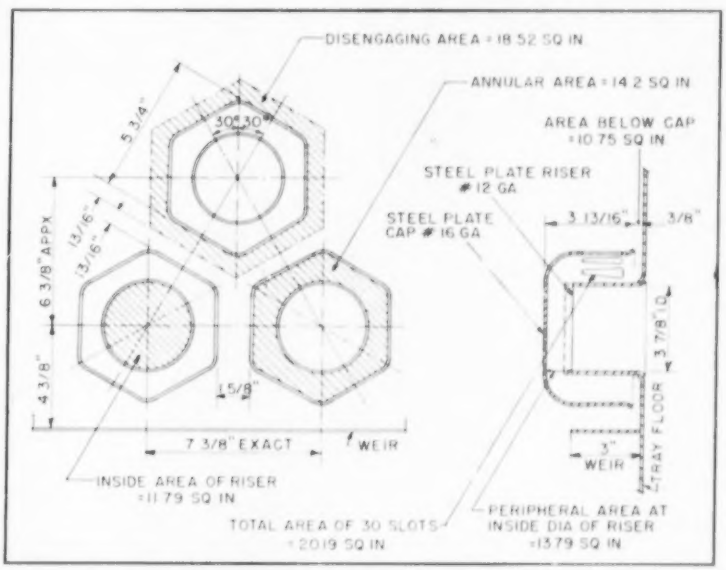
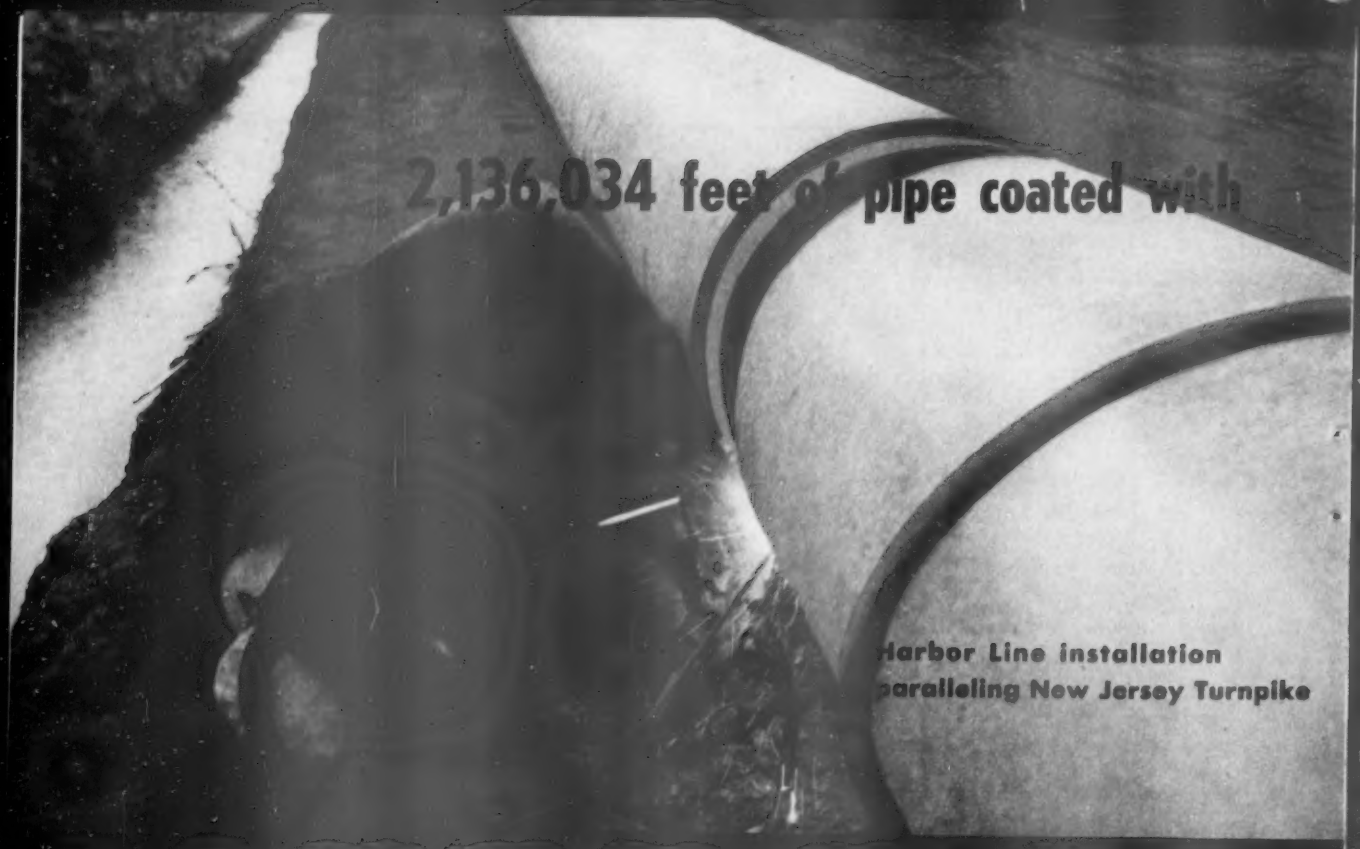


Fig. 5—Typical layout of bubble-cap assembly, Gulf Oil Corp.

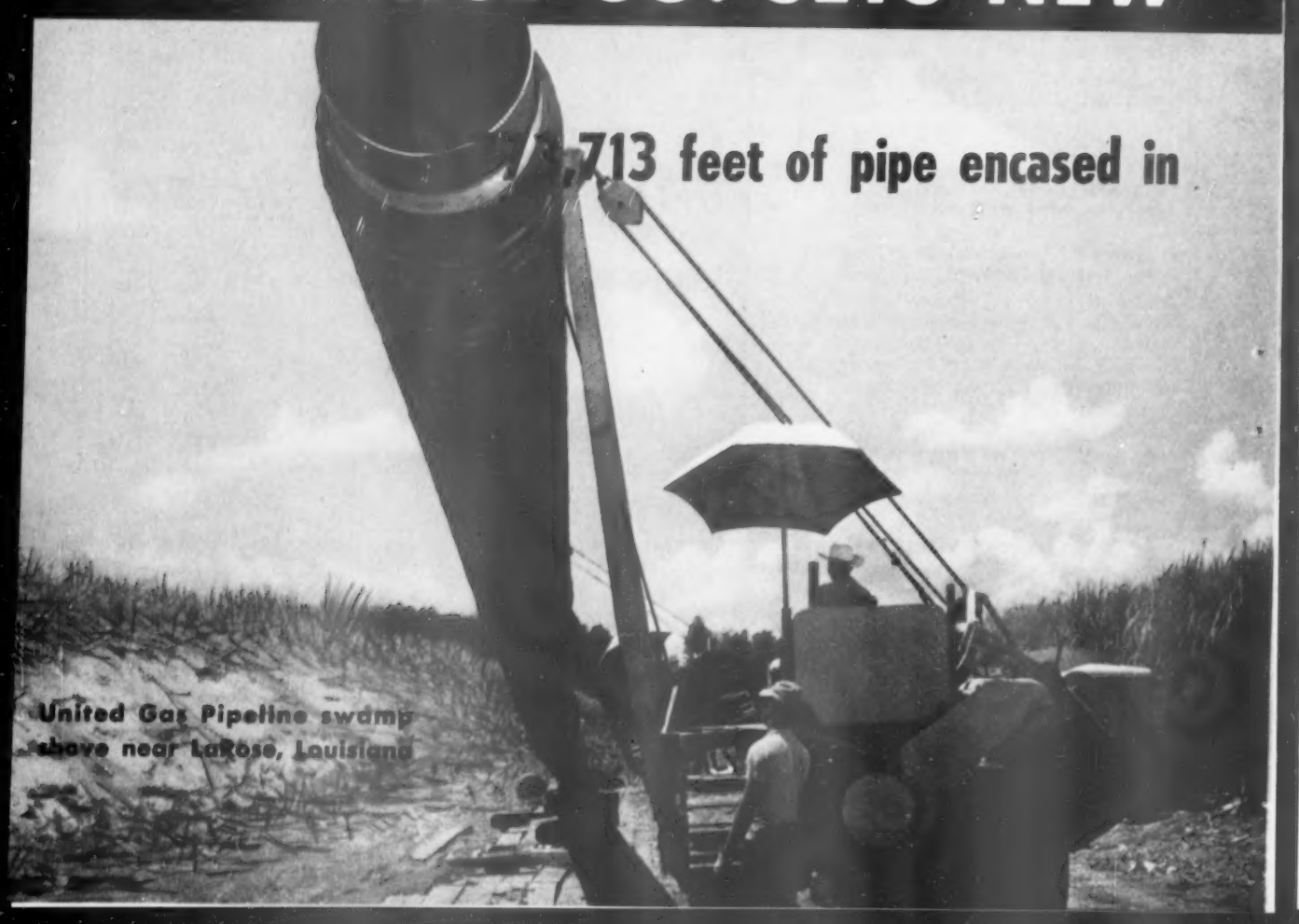
TABLE 1—CAP-TYPE TRAYS — PERFORATED-PLATE-TYPE TRAYS
Capacities of Available Vapor Areas

Tray Spacing, in.	30	24	30	24
Density Factor $= \frac{D_L - D_V}{D_V}$	180	180	180	180
	Capacities cu. ft. per second/ Sq. Ft.—%		Capacities cu. ft. per second/ Sq. Ft.—%		Vapor Area Required %	%
5¾-in. Gulf plate-type cap	5.35	100	3.49	100	100	100
22.6 per cent free area—perf. plate	6.45	120	4.67	133	83	75
30 per cent free area—perf. plate	8.75	163	6.34	182	61	55
36 per cent free area—perf. plate	11.10	207	8.05	231	48	43

The holes in the plate are ⅛-in. or larger, and the spacing is about 11/32 in. The velocity of the vapor is fixed so that the resulting pressure drop is at least equal to the height of liquid on the tray. The height of liquid equals the weir height, plus the height of liquid as a function of liquid volume and weir



H. C. PRICE CO. SETS NEW



SOMASTIC*

More than 400 miles of pipe—averaging 16 inches in diameter—coated with Somastic at permanent and railhead plants by H. C. Price Co. last year. Among the users of Somastic during 1953 were

- Assures permanent protection against exterior corrosion
- Conserves steel because wall thickness of pipe needs only be sufficient to withstand operating pressures
- Adds important weight to lines where negative buoyancy is a problem
- Can be hauled and strung, roll welded, bent cold, lowered into trench and backfilled by ordinary methods without damage to coating

Reg. U. S. Pat. Off.

Atlantic Refining Company
Buckeye Pipe Line Company
Detroit Edison Company
Duquesne Light Company
Gulf Interstate Gas Company
Gulf Oil Refining Company
Florida Power and Light Company
Interstate Natural Gas Company
Interstate Oil Pipe Line Company
Niagra Mohauk Power Company
Okonite-Callender Cable Company
Phelps Dodge Corporation
Philadelphia Electric Co.
Philadelphia Gas Works Co.
Sinclair Pipe Line Company (Harbor Line)
Sun Pipe Line Company
The Texas Company
United Gas Pipe Line Company
Wolverine Pipe Line Company

COATING RECORDS . . .

HEVICOTE*

Nearly 150 miles of pipe—averaging 16 inches in diameter—was encased in HEVICOTE at permanent and railhead plants by H. C. Price Co. last year. Among the users of Hevicote during 1953 were

Hevicote is a heavy-density reinforced concrete coating designed to provide negative buoyancy to pipelines laid under water or in swamps. The thickness of Hevicote can be varied to provide the necessary weight for any pipe size in any type fluid.

- Assures sufficient weight for permanent anchorage at marine crossings
- Eliminates need for extra-thick wall pipe or expensive river weights
- Avoids costly repair or replacement of line
- Distributes structural stress evenly
- Permits easy handling because of smoothness and flexibility

Reg. U. S. Pat. Off. Pending

Buckeye Pipe Line Company
Gulf Interstate Gas Company
Gulf Oil Refining Company
Humble Oil & Refining Company
Interstate Natural Gas Company
Interstate Oil Pipe Line Company
Philadelphia Electric Company
Sinclair Pipe Line Company (Harbor Line)
Southern Natural Gas Company
United Gas Pipe Line Company
Wolverine Pipe Line Company

Whether your pipe line job calls for coating 200 feet or 200 miles, we are anxious to discuss with you the advantages of Somastic and Hevicote. For further information, call or write:

PHILADELPHIA
Phone Orchard 3-9132
P. O. Box 6120

BARTLESVILLE, OKLAHOMA
Phone 4700
P. O. Box 1111

NEW ORLEANS
Phone Edison 2281
P. O. Box 263, Harvey, La.

Permanent and railhead coating plants

SOMASTIC
H. C. **PRICE** CO.
HEVICOTE

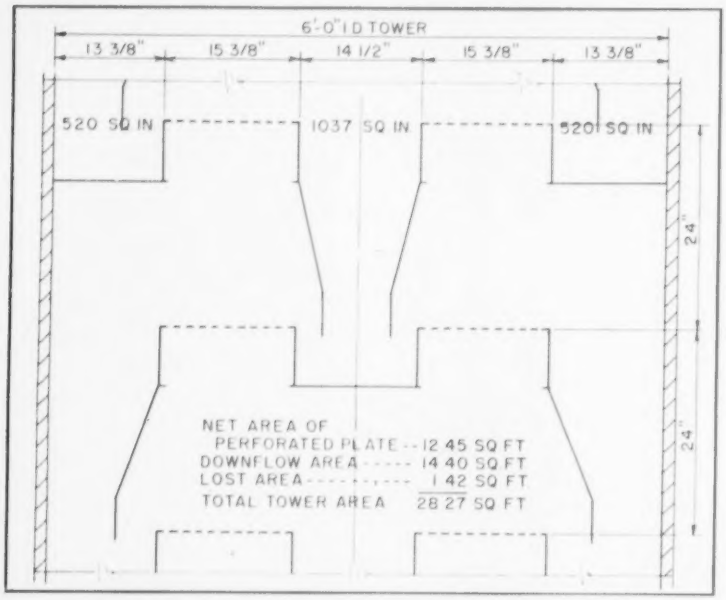


Fig. 6—Typical Gulf design, twin-flow perforated-plate type tray.

length. Each of the holes in the plate simulates a small bubble cap, and operation of the tray is similar to the low-tray-spacing cap-type tray.

Gulf design . . . Fig. 4 illustrates a Gulf high-tray-spacing perforated-plate-type tray. The vapor velocity is high enough to push the liquid into the space between the trays. No definite liquid level is maintained, and weirs are not required. In fact, weirs do more harm than good, in that they would act as baffles for this tray design, increasing the height to which the liquid is pushed, which of course is not desirable.

There is no quieting zone. The total available tower area is utilized by the vapor area, and the liquid area, with the exception of a small percentage taken up by supports and required material thickness for weirs. The perforated holes are smaller, about 3/32 in., and more closely spaced, 5/32 to 3/16 in.

Fig. 6 shows a typical Gulf design, perforated plate tray layout. Liquid does not readily flow through small holes, due to the surface-tension effect, and the adhesion of the liquid to the metal surface. For this reason, high liquid rate may be handled without necessarily increasing the vapor velocity to prevent large volumes of liquid dumping through the perforated plate, rather than flowing into the downflow as it is supposed to do.

Operation differences . . . This indicates the difference in operation of low-tray-spacing and high-tray-spacing trays, as far as the vapor is concerned. The flow of liquid is also different. For the low-tray-spacing-type trays, the liquid flows over the weir into the downflow, and the length of the weir is of particular importance. The size of the downflow area itself is, of course, also important.

For the high-tray-spacing-type trays, the liquid does not, literally speaking, flow over the weir. It approaches the area above the downflow inlet area, where the preliminary separation of vapor and liquid takes place after the vapor-liquid contact has taken place, directly above the caps, or the perforated plate.

Liquid and vapor mist falls into the downflow. The inlet area as well as any restricted area in the downflow area may, in this case, be considered an orifice, and it is the designer's problem to see that the height of vapor-liquid mixture fluid does not build up excessively above the various downflow restricted areas—or orifices. Usually the inlet area is the important area to consider.

The buildup of liquid height in downflows, in high-tray-spacing-type trays due to pressure drop over the tray and resistance of fluid flowing through the downflows, is usually not a serious problem. That is often a problem for the low-tray-spacing-type trays, simply because there is not much height to give away.

Vapor capacities . . . The vapor capacities in cubic feet per square feet of vapor area vary for the various designs. Obviously, the high-tray-spacing groups of trays with high vapor velocities have a high vapor capacity.

The low-tray-spacing tray design results in short, wide towers, and the high tray spacing tray design results in tall, narrow towers.

TABLE 2—DEISOPENTANIZER

Feed charge—333 bbl./hr., or 8,000 bbl./day		
Tray type—Envelope type downflows	5¾-in. Gulf Bubble Cap	Gulf Perf. Plate-36%
Tower diameter	13 ft.-6 in.	10 ft.-6 in.
Tower pressure—psig.	42	42
Tray spacing	24	24
Theoretical number of trays	43	43
Actual number of trays	58	58
Height of tower—ft.	126	126
Tray material—type	304 SS	304 SS
Estimated cost of trays—$	175,000	95,000
Estimated cost of tray installation—$	38,000	19,000
Estimated cost of tower shell—$	36,000	26,000
Estimated cost of insulation—$	11,000	8,000
Total—$	260,000	148,000

TABLE 3—ECONOMIC COMPARISON OF TOWER DESIGN

Tower service			Depropanizer	Debutanizer
Tower pressure—lbs. psia.			352	85
Tray type	"X" Cap Type	Gulf Perf. Plate	"X" Cap Type	Gulf Perf. Plate
Rectifying Section				
Tower diameter, ft.	9½	5½	8	5½
Tray spacing, in.	24	24	24	24
Number of trays	12	12	20	20
Stripping Section				
Tower diameter, ft.	9½	7	8	5½
Tray spacing, in.	24	30	24	30
Number of trays	12	12	20	20
Height of tower, ft.	55	63	89	98
Tray material	C. Stl.	C. Stl.	C. Stl.	C. Stl.
Perf. plate material—alloy steel, type		316		316
Shell thickness, in.	1⅜	⅞ & 1-1/16	⅝	⅝
Estimated cost of trays (incl. install'n)	$32,000	*$13,400	$38,000	†$17,100
Estimated cost of shell	47,000	23,100	26,200	18,800
Total	$79,000	$36,500	$64,200	$35,900
Difference in cost		$42,500		$28,300

*For Trays of S.S. Type 316—Add $5,200
†For Trays of S.S. Type 316—Add $6,650

is Beacon's secret of success in the marketing of petroleum products . . .

Like plotting a ship's course — petroleum products marketing is a specialized business and requires careful planning — to build steady customers. Beacon's reputation of never letting a customer down means a steady outlet for refiners — and a constant source of supply for dealers. Whether you are buying or selling petroleum products — Beacon can chart a course for you that will mean bigger profits.

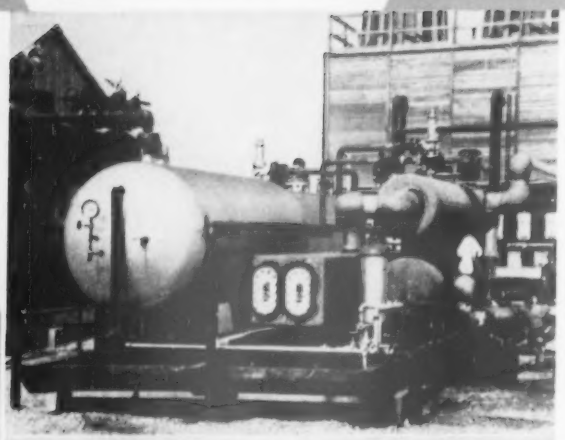
BEACON PETROLEUM COMPANY

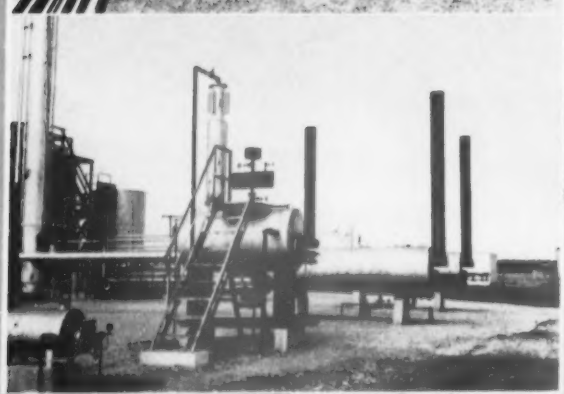
TULSA • HOUSTON

BEACONGAS

Marketers of Natural Gasoline, Butane-Propane, Motor Fuel, Fuel Oils

This Operator Now Converts Flare Gas Into Profit With A...





Here is another case where a BS&B *lease-located* "COLD-FRAC"* System Gasoline Plant has resulted in a more efficient operation and increased revenue for the operator – and for his neighbors!

These plants have been creating a stir throughout the industry because of their high profit-to-cost ratio, their simplicity of operation and their all-around excellent performance!

If you, as a lease operator, have been "flaring off" a lot of your profits, you'll be wise to call in your BS&B Representative to talk things over. He will recommend the type of "COLD-FRAC"* installation you need to put your operation on the highest revenue-producing basis. Or write us direct – there's no obligation!

EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY

BLACK,

LEASE-LOCATED COLD-FRAC* SYSTEM GASOLINE PLANT

LOW TEMPERATURE BS&B SEPARATION

An Actual Case History From Our Files:

PROBLEM: This southern Oklahoma lease operator† had been flaring rich low-pressure gas from wells on his two producing leases. Other producers in the immediate area were following a similar practice. It seemed to him that there should be some practical and economically justifiable means of eliminating this waste and converting it into additional *profit*.

SOLUTION: There was! First, he signed purchase contracts with other operators in the area for their flare gas to be pooled with his own for further processing. Then a BS&B *lease-located* "COLD-FRAC"* System Gasoline Plant was erected for the production of natural gasoline and LPG from low-pressure gas. Its design capacity:

Flow Rate—5 MM Cubic Feet of Gas Per Day
Pressure—20 p.s.i.g. (Compressed to 420 p.s.i.g.)
Temperature—100° F. (Leaving Compressor Aftercooler)

RESULT: Within a few months this new BS&B "COLD-FRAC"* System was installed and in operation. It is now being supplied by ten tank batteries, and is performing as follows:

Flow Rate (Plant Inlet)—4.5 MM Cubic Feet of Gas Per Day
Residue Gas To Sales Line—400 p.s.i.g.
Temperature—85° F. (Leaving Aftercooler)
Dehydration of Sales Gas—To Dew Point of —10° F.
Gasoline Recovery—5,000 Gallons of 26 psi. Reid Vapor Pressure Gasoline Per Day
LPG Recovery—3,000 Gallons of 100 psi. True Vapor Pressure LPG Per Day
Commercial Propane—3,000 Gallons Per Day

This operator is now converting a former waste product into a handsome profit . . . and is delivering pipeline specification gas to the sales line. With very little *additional* equipment, he can expand his "COLD-FRAC"* System Gasoline Plant to handle up to 7 MMSCFD. Another well-satisfied BS&B "COLD-FRAC"* System user!

*"COLD-FRAC" is a trade-mark of Black, Sivalls & Bryson, Inc. (Patented and patents applied for)
†Name supplied on request

SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A4B

1708 West Main Street—Oklahoma City, Oklahoma

The former group is particularly suited for towers that must be erected inside buildings, calling for a limited height.

The latter group is considerably more economical to build, but often is quite tall. Existing towers of this type are as high as 140 ft.

A comparison of capacities of up-to-date Gulf cap-type design towers, and Gulf perforated-plate-type design is shown in Table 1. In this table the trays were designed for density factor

$$\frac{D_L - D_V}{D_V} = 180$$

which corresponds to an atmospheric tower, taking gasoline and (stripping) steam overhead.

The perforated-plate-type tray is not here being compared with an old, out-of-date cap-type tray design. This cap-type tray is fully up to date in design, and is in competition with other cap-type trays.

With further study and applications of these data, a cost estimate has been worked up, as shown in Table 2, which is a direct comparison of Gulf designs. The perforated tray is particularly favored in this instance because of the high percentage of vapor area to gross tower area.

Table 3 shows an economic comparison of a depropanizer and a debutanizer. The given tower diameters, 9-ft. 6-in. and 8-ft. were recommended by others, but these towers are now being built with the Gulf perforated-plate-type tray, as indicated in Table 3.

8. FLEXITRAY . . . Has Moderate Capacity and Wide Operating Range

by G. C. Thrift

THE Kaskade tray[1,2,3,4] which was first used commercially in 1943, after extensive laboratory study, now has approximately 350 installations in an extremely wide range of services from 7 mm. Hg absolute to 1,000 psig. pressure and as low as 7-in. tray spacing.

Author is with Koch Engineering Co., Wichita, Kans.

Benturi tray . . . The evolution to the "Benturi" type, announced in 1952[5] after 2 years of commercial use, was a result of extensive study of operating results and design variables affecting plate efficiency and throughput. The simplicity and lower pressure drop per theoretical plate have contributed greatly to its increased popularity. Despite current design practice of using the same efficiency as bubble trays, operating results in many ranges have indicated higher efficiencies than would be expected of conventional bubble trays.

Efficient use of the higher available Benturi slot energy has resulted in higher efficiencies in the ranges of butane and heavier liquids. Increased efficiencies are more pronounced in viscous range such as absorption oils and heavier. Butane separating efficiencies well in excess of 100 per cent can be predicted under many conditions. Absorber tray efficiencies in the range of 75 to 100 per cent have been experienced, whereas bubble-tray efficiencies in the range of 25 to 30 per cent would be expected.

Slot velocity . . . Both the original Kaskade and the later Benturi have very similar slot velocity vs. efficiency curves, the plateau of highest efficiency being at higher operating rates than usually allowable on conventional bubble trays. Published ratings of Benturi trays[5] are purposely made conservative in many ranges and the manufacturer should be consulted on final ratings.

Flexitray

The demand for a tray of moderate capacity and extremely wide operating range has led to the development of the third design of Kaskade known as the Flexitray. This tray has ratings approaching those of a well-designed perforated tray yet retains an efficient range exceeding that of conventional bubble trays.

Applications . . . Due to its simplicity,

TABLE 1—COMPARISON OF KASKADE WITH BUBBLE TRAYS IN HIGH-PRESSURE ABSORPTION

	Inlet gas, both towers, mole per cent	Residue gas, mole per cent		Moles absorbed* per hour from gas		Per cent absorbed	
		Bubble trays	Kaskade trays	Bubble trays	Kaskade trays	Bubble trays	Kaskade trays
CO_2	0.60	0.20	0.40				
C_1	89.60	93.69	94.09	120.00	124.00	13.4	12.4
C_2	5.60	4.44	4.61	19.20	19.20	34.4	30.6
C_3	2.43	1.45	0.73	12.30	20.40	50.6	75.0
iC_4	0.49	0.22	0.17	3.10	4.00	63.0	71.5
nC_4	0.70			6.90	7.80	100.0	100.0
iC_5	0.21			2.10	2.35	100.0	100.0
nC_5	0.21			2.10	2.35	100.0	100.0
C_6	0.08			0.80	0.90	100.0	100.0
C_7+	0.08			0.80	0.90	100.0	100.0
Total	100.00	100.00	100.00	167.30	181.90		
Sp. gr.	0.639	0.594	0.589				
Rich gas to tower, M.c.f.d.		†9,090	†10,220				
Lean oil to tower, g.p.m.		56.5	56.5				
Pressure, psig.		745	745				
Lean-oil temperature, °F.		88	88				

*From rich oil analysis. †Calculated from residue gas meter readings.

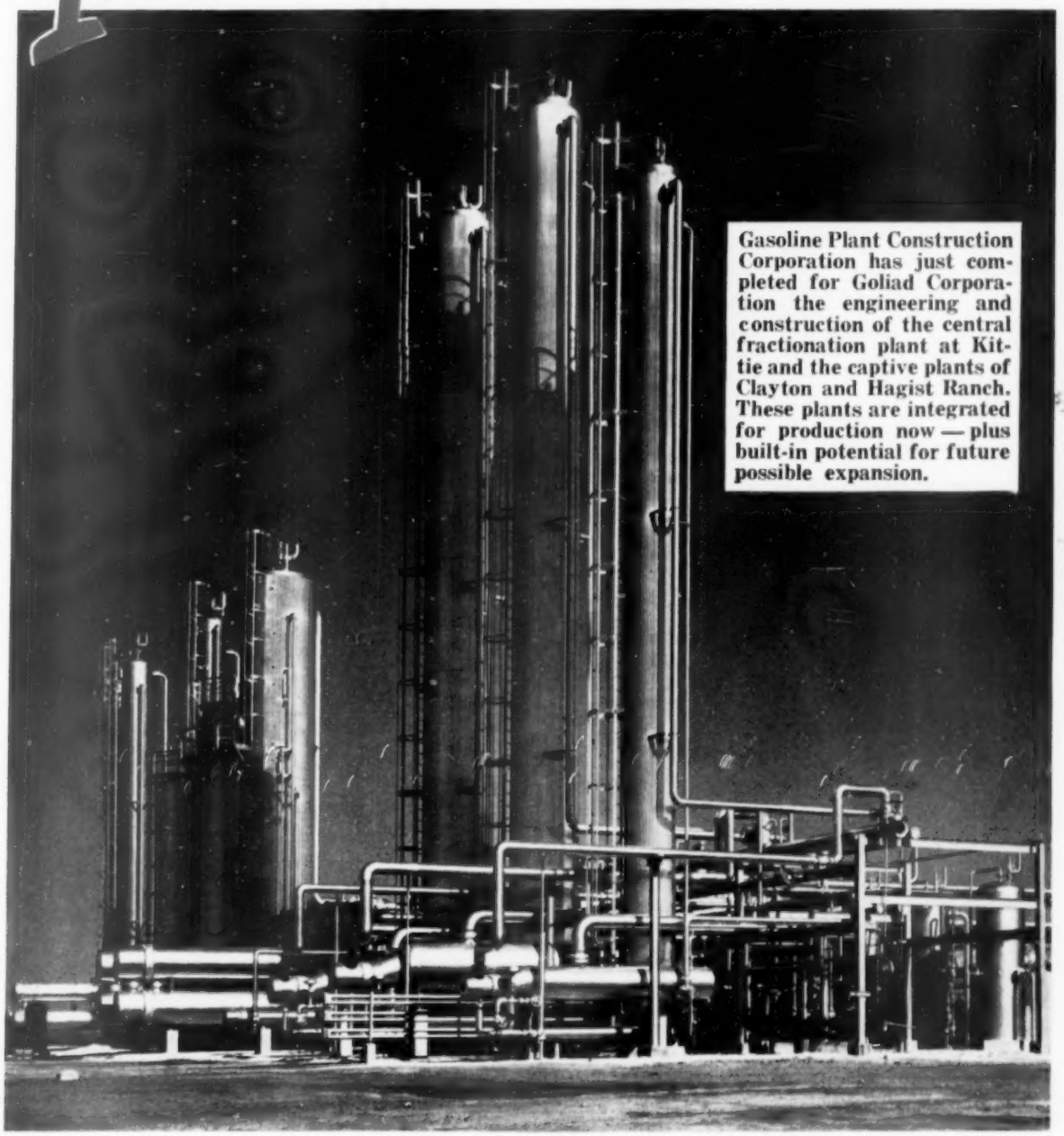
TABLE 2—PERFORMANCE OF LOW-PRESSURE ABSORBER, BENTURI TRAY

Component	Mole per cent		Absorption*	
	Rich gas	Lean gas	Moles/100 moles rich gas	Per cent on feed
C_1	79.87	88.25	0	0
C_2	6.45	7.13	0	0
C_3	6.20	4.11	2.48	40.0
iC_4	1.35	0.38	1.01	74.8
nC_4	2.32	0.13	2.20	94.8
iC_5	0.77		0.77	100.0
nC_5	0.17		0.17	100.0
C_6+	2.87		2.87	100.0
Total	100.00	100.00	9.50	

	Eleven-tray absorber		
	Theoretical trays (calc.)	Per cent efficiency	Per cent absorbed
C_3	2	18.2	40
iC_4	5	45.5	75
nC_4	8	72.6	95

*Assuming no C_1 or C_2 is absorbed.

INTEGRATION Along the Wilcox Trend

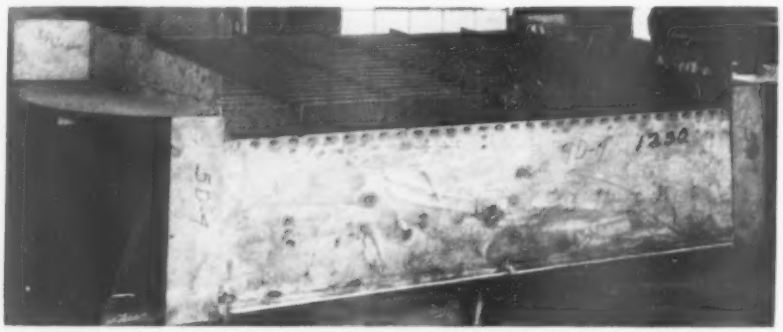


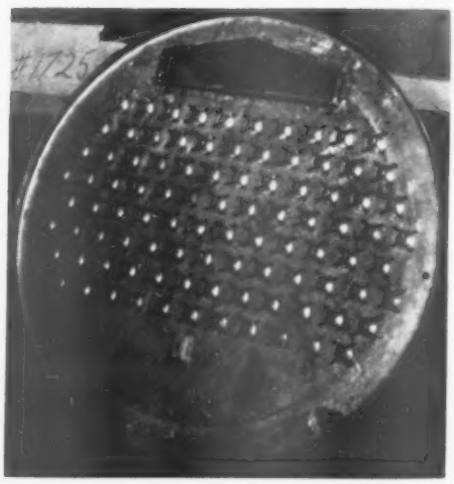
Gasoline Plant Construction Corporation has just completed for Goliad Corporation the engineering and construction of the central fractionation plant at Kittie and the captive plants of Clayton and Hagist Ranch. These plants are integrated for production now — plus built-in potential for future possible expansion.

ENGINEERS • DESIGNERS • CONSTRUCTORS

GASOLINE PLANT CONSTRUCTION CORP.

NIELS ESPERSON BLDG., HOUSTON WILSON TOWER, CORPUS CHRISTI



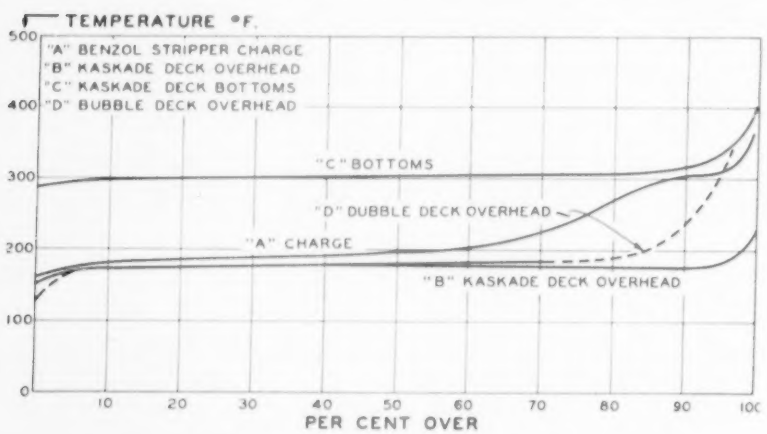


Koch Benturi-type trays are shown in these views. Column at left is equipped with the Flexitray on the three upper trays. An 11½-ft.-diameter Benturi-type Kaskade tray is shown in photo above. Typical copper construction of Flexitray for chemical industry is shown at right.

TABLE 3—TYPICAL KASKADE THROUGHPUT DATA

Diam., ft.	6 ft. 6 in.	6 ft. 0 in.	6 ft. 0 in.	5 ft. 6 in.	5 ft. 0 in.	4 ft. 6 in.	2 ft. 6 in.	2 ft. 6 in.
Tower service	Absorber	Deprop.	Syn. tower	Syn. tower	Absorber	Debut.	Debut.*	Debut.
Vapors:								
Lb./hr.	117,000	148,000	82,480	74,700	121,000	83,000	36,000	27,832
ρv, lb./cu. ft.	0.81	3.06	0.175	0.217	3.113	2.34	2.0	1.84
Liquid:								
G.p.m.	1,070	860	319	156	405	485	100	80
ρL, lb./cu. ft.	50	29	45.1	40.4	41.4	34.0	36	36
Tray space, in.	24	24	36	24	27	20	24	24

*Tests indicate greater than 100 per cent tray efficiency; unusual for such a small tower.



Distillation curves for benzol-cumene stripper.

Editor's Note . . .

THIS FRACTIONATION SECTION WILL BE REPRINTED. The instrumentation material and the tray forum presented here will be combined with a previously published series on Design and Evaluation of Absorbers, to make a 72-page reprint manual. The absorber series ran on the Journal's Field Processing page, beginning with issue of November 9, 1953, and continuing through the issue of March 15, 1954.

Price of the reprint will be $1.00. Send orders to Reader Service Department, The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Oklahoma.

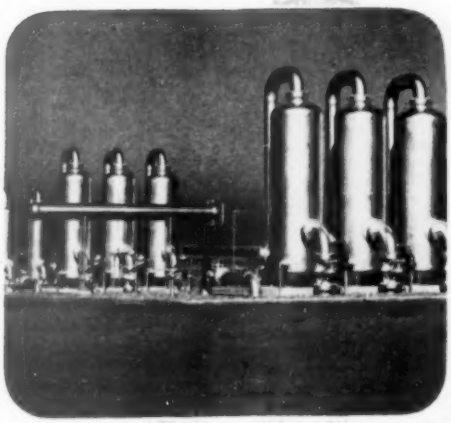
CONSULTANTS, DESIGNERS,

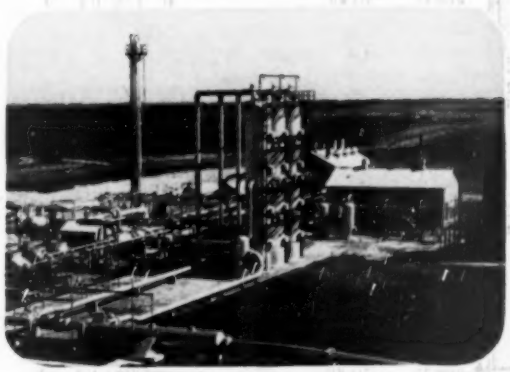
AND CONSTRUCTORS OF:

Natural Gasoline and Liquefied Petroleum Plants
Desulphurization Plants – Compressor Stations
Solid and Liquid Dehydration Plants
Pipe Line Pump Stations
Recycling and Pressure Maintenance Plants
Petroleum Industry Process and Construction

DRESSER engineering COMPANY

Since 1926 . . .





We specialize in handling complete projects from inception; including evaluation of processes, engineering design, purchasing and complete construction ready for operation.

DRESSER ENGINEERING COMPANY

706 S. Boston — Tulsa 1, Okla.

P. O. Box 2518

L. L. Dresser, Pres. — Phone 4-2411

low weight, and adaptability to mass production, this tray is recommended when the tray cost is inherently an appreciable percentage of the total tower installation costs. Typical installations are essentially atmospheric or moderate pressure with carbon-steel vessels, or above the feed zones in light-ends fractionators. Benturi trays are required below the feed, due to the heavier loading, but the lower loading above the feed does not justify Benturi use in this zone.

The Flexitray, more completely described in current literature,[6] has liftable caps approximately 2 in. in diameter, held down by plate stamped spiders whose projections are clinched on the underside of the deck. These caps are spaced on a triangular pitch of 3 to 6 in. in a similar manner to bubble trays. The caps and holddowns are furnished in alloy even though the remainder of the tray is of carbon-steel materials.

No hydraulic gradients . . . To insure uniform vapor distribution, at very low loads on trays inadvertently installed out of level, alternate rows of caps are of different weight. The absence of hydraulic gradients and the fact that the maximum slot velocity is directed horizontally contribute appreciably to the flexibility and high throughput of Flexitrays.

The accompanying tables and charts indicate performance obtained with Kaskade trays.

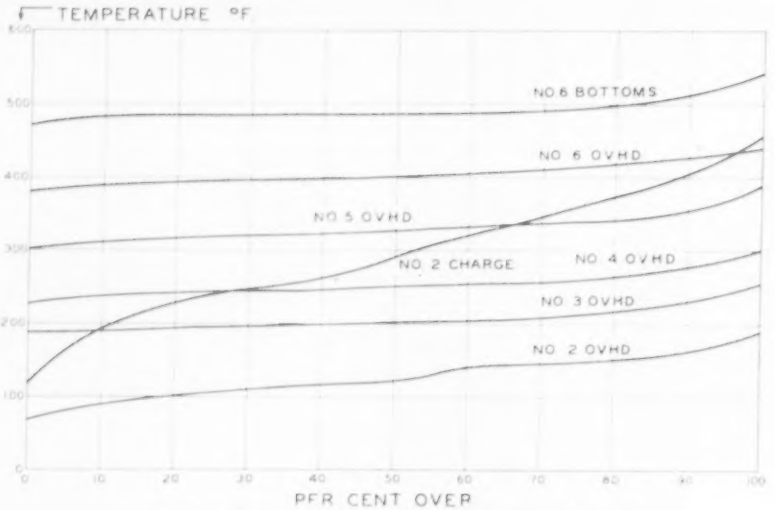
The low pressure drop per theoretical tray has made the Benturi tray attractive in vacuum flashers and many heat-sensitive materials separations.

Besides the extensive use of Kaskades in the oil-refining, natural-gasoline, and petrochemical industries, Kaskades are being increasingly used in the chemical industry. At this time a wide range of materials are being separated with Kaskades, including:

Acetones, acetates, acetylene, alcohols, amines, cyanides, fatty acids, formaldehyde, glycols, ketones, mercaptans, phenols, polymers, resins, and tar-base oils.

References

1. H. Litwin, The Oil and Gas Journal, March 22, 1947.
2. H. Litwin, World Petroleum, March 1948.
3. F. Duane Fuqua, Petroleum Processing, November 1948.
4. Transactions, Institute of Chemical Engineers (British), Vol. 31, 1953.
5. Thornton, Petroleum Processing, May 1952.
6. Chemical Engineering, May 1954.

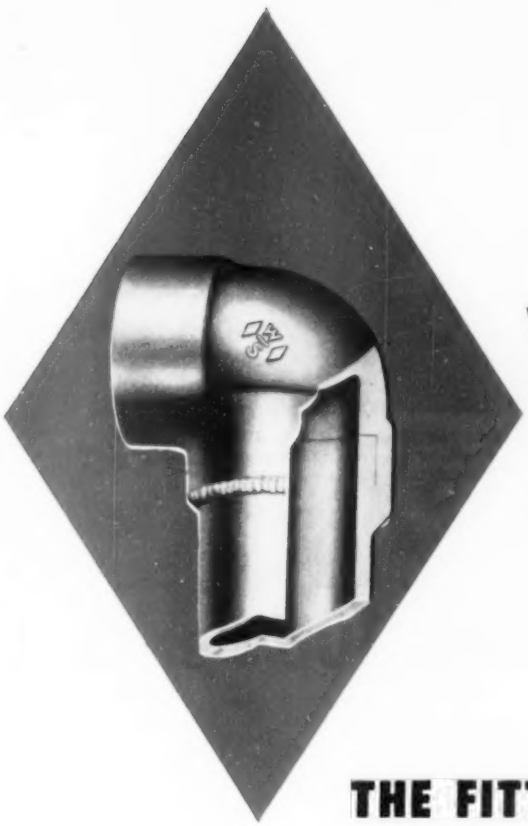


A.S.T.M. distillations of charge and products on naphtha unit.

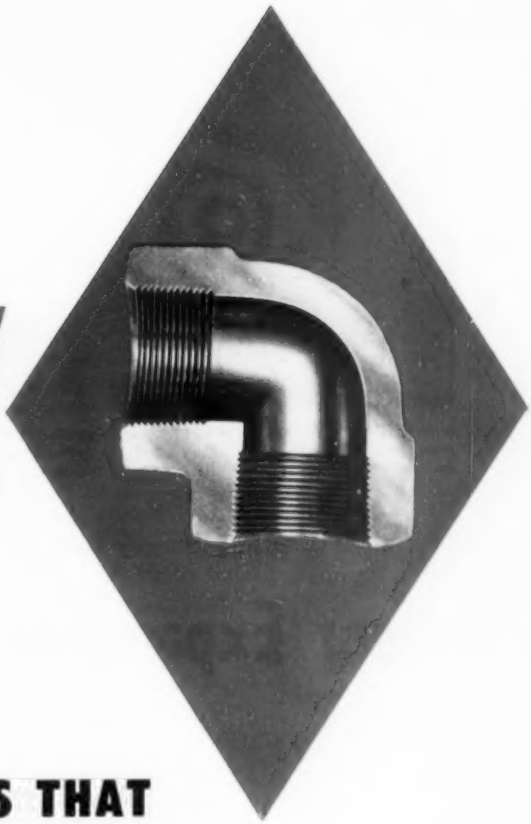
TABLE 4—REFINERY DEPROPANIZER OPERATION BEFORE AND AFTER INSTALLING BENTURI-TYPE KASKADE TRAYS

	Depropanizer charge*		Depropanizer overhead gas†		Stabilized naphtha distillate*	
Analysis, volume per cent—	Before	After	Before	After	Before	After
$N_2 + CO_2$				1.7		
O_2				0.3		
H_2			0.5			
CH_4			0.2	0.4		
C_2H_4			0.2			
C_2H_6			3.8	7.3		
C_3H_6			0.3			
C_3H_8			29.3	63.8		
Total C_3 cut	2.1	1.9				
iC_4		0.7	15.3	10.4		
nC_4		4.4	19.3	2.5	2.4	
C_4 paraffins	4.7					5.6
C_4 olefins	0.1		0.1			0.1
iC_5	2.9	4.7	0.1	0.1	5.9	4.0
nC_5	6.1	5.3		0.6	5.4	5.3
C_6+	84.1	82.8			86.3	85.0
H_2S		0.2	30.9	12.9		0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
H_2S, g./100 ml.	0.328	0.175			0.0014	0.0005
Tests:						
Gravity, °A.P.I.	63.1	62.3			62.2	61.6
Vapor pressure		9.6	1.575 (sp. gr.)	1.548 (sp. gr.)		6.4
Dist. (A.S.T.M.), °F.:						
I.b.p.	102	94			110	100
5 per cent	134	136			148	138
10 per cent	152	154			160	154
20 per cent	176	178			178	176
30 per cent	194	198			194	196
40 per cent	207	214			206	212
50 per cent	220	228			219	226
60 per cent	231	242			230	240
70 per cent	243	256			240	252
80 per cent	256	272			254	270
90 per cent	273	294			270	289
95 per cent	290	310			282	304
E.p.	336	336			328	341
Rec., per cent	98.0	98.0			98.0	98.0
Yields, vol. per cent	‡21.16	‡27.46	§3.2	§2.5	‡20.50 §96.8	‡26.79 §97.5
Rates, bbl. per hour	375	488	21,412 M.c.f.h.	21,511 M.c.f.h.	363	476

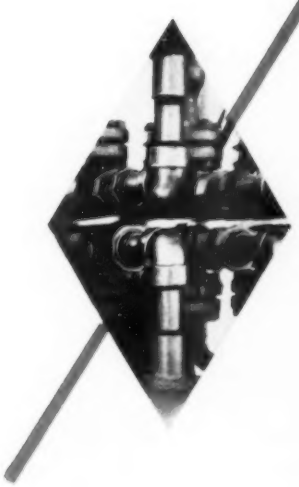
*Low temperature fractional distillation. †Mass spectrometer. ‡Based on crude. §Based on depropanizer charge. Note the increased capacity after Kaskade replacement of bubble trays.



W-S



THE FITTINGS THAT CAN REALLY TAKE IT!



Every elbow, tee and cross in a high pressure piping system is a point of concentrated stress. W-S Forged Steel Fittings take this tough service in stride because they're fabricated and designed to resist pressure, heat, shock and vibration. They're drop forged of highest quality steel to produce a dense, tough, forged-fiber structure that can really take it. And careful heat treatment after forging develops the metallurgical properties of the steel to their fullest.

Notice, too, how Watson-Stillman engineers have designed extra strength into the fittings. Long bands extend well beyond the threads or sockets to provide extra reinforcement. Wall thickness is carefully calculated to put extra metal at points of severest stress.

W-S high-precision machining and rigorous inspection follow through to give you the fittings that mean stronger, tougher pipe joints. W-S Forged Steel Fittings are available in both Screw-End and Socket-Welding types in carbon, stainless and alloy steels.

Sold Through Leading Distributors

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

A MODERN TREND in natural-gasoline plants, that of processing gas from a number of fields, is exemplified by the East Vealmoor plant of Reef Fields Gasoline Corp., shown here. The plant, located near Big Spring, Tex., handles casing-head gas from five West Texas fields. (See October 19, 1953, issue of the Journal.)

Journal's Field Processing Survey Shows That

Postwar Expansion Exceeds 100 Per Cent

by John M. McGivern
District Editor

THE OIL AND GAS JOURNAL in its 1954 natural-gas field processing survey shows these operations distinctly for the first time: (1) gas capacity, (2) natural-gasoline produced, (3) L.P.G. produced, and (4) gas injection.

All figures, except where designated by "est.," are those reported to the Journal by the individual companies. The survey editors of the Journal requested gas capacity in millions of cubic feet per day and requested natural-gasoline and L.P.G. production in gallons per day.

The 1954 survey lists accurate figures on 455 natural-gasoline operations in the United States. Figures show that 19 of the 48 states now process natural gas. The latest state to show an operating plant is that of Michigan where Dow Chemical Co. now has a plant handling 4 million cubic feet of gas daily and producing 9,400 gal. of natural gasoline a day.

The tremendous growth of the natural-gasoline industry since the war is clearly shown [illegible] compared with past surveys. Since 1946, the petroleum industry's production of natural gasoline and L.P.G. has increased by well over 100 per cent.

Production of natural gasoline in both natural-gasoline and cycling plants during 1953 totaled somewhat more than 21 million gallons daily. Total L.P.G. was produced at the rate of about 11.5 million gallons daily. Total liquids from cycling and natural-gasoline plants were produced at the rate of 33 million gallons daily.

NATURAL-GASOLINE PLANT SUMMARY

State—	No. of plants	M.M.c.f. of gas processed daily	Gallons per day— Natural gasoline produced	Gallons per day— Total butane and lighter
Arkansas	6	142	137,290	102,677
California	67	1,747	2,299,864	1,116,130
Colorado	3	75	44,349	40,000
Illinois	7	38	95,470	278,000
Kansas	14	1,745	417,470	329,847
Kentucky	4	1,080	108,000	415,000
Louisiana	39	1,830	931,814	476,107
Michigan	1	4	9,400	None
Mississippi	1	4	8,000	10,000
Montana	1	65	12,000	18,000
Nebraska	1	13	7,400	17,500
New Mexico	13	1,066	793,684	344,064
Ohio	2	32	4,550	None
Oklahoma	61	1,289	1,916,270	768,136
Pennsylvania	6	145	21,493	2,445
Texas	182	10,207	10,497,897	5,278,967
Utah	1	22	869	None
West Virginia	38	674	192,250	136,200
Wyoming	8	269	164,363	149,740
Total	455	20,447	17,662,433	9,482,813

Construction . . . Construction plans have decreased when compared with the figures for 1953; however, the drop is not serious enough that it couldn't be overcome with a sudden spurt of construction in the latter half of 1954.

Building activity is especially strong in the Wyoming area where several companies and individuals have plans for plants.

Homer S. Head & Associates, a group of Houston oil men, have bought land at Newcastle, Wyo., on which to build a plant. The plant is slated to be on stream by autumn and is scheduled to process gas from Clareton field.

Lakota Petroleum Corp. is planning a plant in the Hay Creek area of Weston County, Wyoming. No tentative dates are established as yet for the starting or completing of the plant.

Socony-Vacuum Oil Co., Inc., heads a group of com-

panies and individuals which will build a plant at Manderson, Wyo., to process 15,000,000 cu. ft. of sour gas daily.

Jefferson Lake Sulphur Co. will supplement the Socony-Vacuum operations by building a sulfur-recovery plant to handle a concentrated hydrogen sulfide stream from the Manderson natural-gasoline plant. Ralph M. Parsons Co., Los Angeles, will build both plants and it has set autumn of 1954 as a tentative date for the completion of the project.

Wyoming Gas Products Corp. also has plans for a plant in Weston County. Fish Engineering Co. has commenced the engineering work but no further plans have been announced. Wyoming Gas Products Corp. is a new firm formed recently by the C. W. Murchison interests of Dallas and Allen & Co., a New York investment firm.

ARKANSAS

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Arkansas Louisiana Gas Co.:			
Columbia, Columbia (Magnolia)	100	53,000	65,000
Hiwan Oil & Gas Co.:			
Atlanta, Columbia (Magnolia)	20	10,000	10,000
Magnolia Petroleum Co.:			
Kenova, Union (Smackover)	2	1,590	877
J. R. Querbes Oil Co.:			
South Field, Union (El Dorado)	1	7,000	None
Shell Oil Co.:			
Magnolia, Columbia (Magnolia)	16	40,700	26,800
Sunray Oil Corp.:			
Midway, Lafayette (Lewisville)	3	25,000	None
Total	142	137,290	102,677

CALIFORNIA

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Bankline Oil Co.:			
Santa Fe Springs, Los Angeles, Santa Fe Springs	5	15,000	2,000
Midway Sunset, Kern (Maricopa)	10	15,000	2,000
Belridge Oil Co.:			
Belridge, Kern (McKittrick)*	80	Not reported	
Coline Gasoline Corp.:			
Rincon-Padre, Ventura (Ventura)	15	13,000	26,000
Continental Oil Co.:			
San Miguelito, Ventura (Ventura)	45	47,594	18,200
Fullerton Oil Co.:			
Huntington Beach, Orange (Huntington Beach)	12	29,000	None
General Petroleum Corp.:			
Wilmington, Los Angeles (Wilmington)	45	76,000	None
Santa Fe Springs, Los Angeles, Santa Fe Springs	15	34,000	None
Ventura, Ventura	15	23,000	None
Helm, Fresno (Burrel)	25	16,500	24,000
Honolulu Oil Corp.:			
Buena Vista Hills, Kern	11	23,100	6,300
Cymric, Kern	40	23,100	23,100
Inglewood Gasoline Co.:			
Inglewood	4	5,500	None
Lomita Gasoline Co.:			
Signal Hill (Long Beach)	50	90,000	20,000
P. S. Magruder (operator of Western-Huffman Gasoline Plants):			
Kings	65	70,000	60,000
Fresno	50	70,000	40,000
Rich Ranch Oil Co.:			
Orcutt, Santa Barbara	1	2,000	None
Richfield Oil Corp.:			
North Coles Levee, Kern (Tupman)*	90	40,000	125,000
Russell Ranch, San Luis Obispo, New Cuyama*	18	20,000	37,000
South Cuyama, Santa Barbara (New Cuyama)*	40	48,000	57,000
Shell Oil Co.:			
Brea, Orange (Brea)	12	42,900	None
Capitan, Santa Barbara (Santa Barbara)	1	1,670	330
Dominguez, Los Angeles (Dominguez)	3	12,600	None
Long Beach, Los Angeles (Long Beach)	4	35,600	None
Santa Maria, Santa Barbara (Santa Maria)	0.6	1,500	None
Ten Section, Kern (Bakersfield)	46	39,500	41,200
Ventura, Ventura (Ventura)	109	216,800	35,900
Signal Oil & Gas Co.:			
Huntington Beach, Los Angeles	50	105,000	37,000
Long Beach, Los Angeles	40	55,000	15,000
Ellwood, Santa Barbara*	15	7,500	3,000
Standard Oil Co. of California:			
Huntington Beach, Orange (Huntington Beach)	15	32,000	9,000
Inglewood, Los Angeles (Inglewood)	15	23,000	None
Murphy Coyote, Orange (La Habre)*	50	63,000	21,000
Santa Fe, Los Angeles (Santa Fe Springs)	5	16,000	None
Seal Beach, Los Angeles (Seal Beach)	20	35,000	None
Torrance, Los Angeles (Torrance)	4	10,000	None
Midway, 1-C, Kern (Taft)*	30	50,000	15,000
Midway, 7-D, Kern (Taft)	8	16,000	None
Midway, 29-G, Kern (Taft)	7	10,000	None
Greeley, Kern (Bakersfield)*	25	18,000	35,000
Lost Hills, Kern (Bakersfield)	3	3,000	None
Mt. View, Kern (Bakersfield)	14	16,000	None
Kettleman North Dome, 3P, Kings (Avenal)*	60	20,000	90,000
Kettleman North Dome, 11P, Kings (Avenal)*	40	42,000	None
Kettleman North Dome, 33J, Fresno (Avenal)*	40	37,000	None
Northeast Coalinga, Fresno (Coalinga)	40	14,000	None
Sunray Oil Corp. (California Division):			
Newhall*	40	16,500	42,000
Superior Oil Co.:			
Rio Bravo, Kern (Shafter)*	30	19,000	51,000
The Texas Co.:			
Santa Fe Springs, Los Angeles, Santa Fe Springs	5	35,000	2,100
Signal Hill, Los Angeles (Signal Hill)	5	65,000	9,000
Shiells Canyon, Ventura, Fillmore	20	20,000	30,000
Tide Water Associated Oil Co. (Western Division):			
Ventura, Ventura	88	90,000	100,000
Union Oil Co. of California:			
Brea, Orange (Brea)	18	55,000	None
Richfield, Orange (Placentia)	5	12,000	None
Santa Fe Springs, Los Angeles, (Santa Fe Springs)	7	58,000	None
Dominguez, Los Angeles (Compton)	18	56,000	None
Rosecrans, Los Angeles (Los Angeles)	12	27,000	None
Playa del Rey, Los Angeles (Venice)	4	6,000	None
Sansinena, Los Angeles (Whittier)	8	8,000	None
Orcutt, Santa Barbara (Orcutt)	8	26,000	9,000
Santa Maria, Santa Barbara, Santa Maria	28	45,000	10,000
Coalinga Nose, Fresno (Coalinga)*	30	30,000	40,000

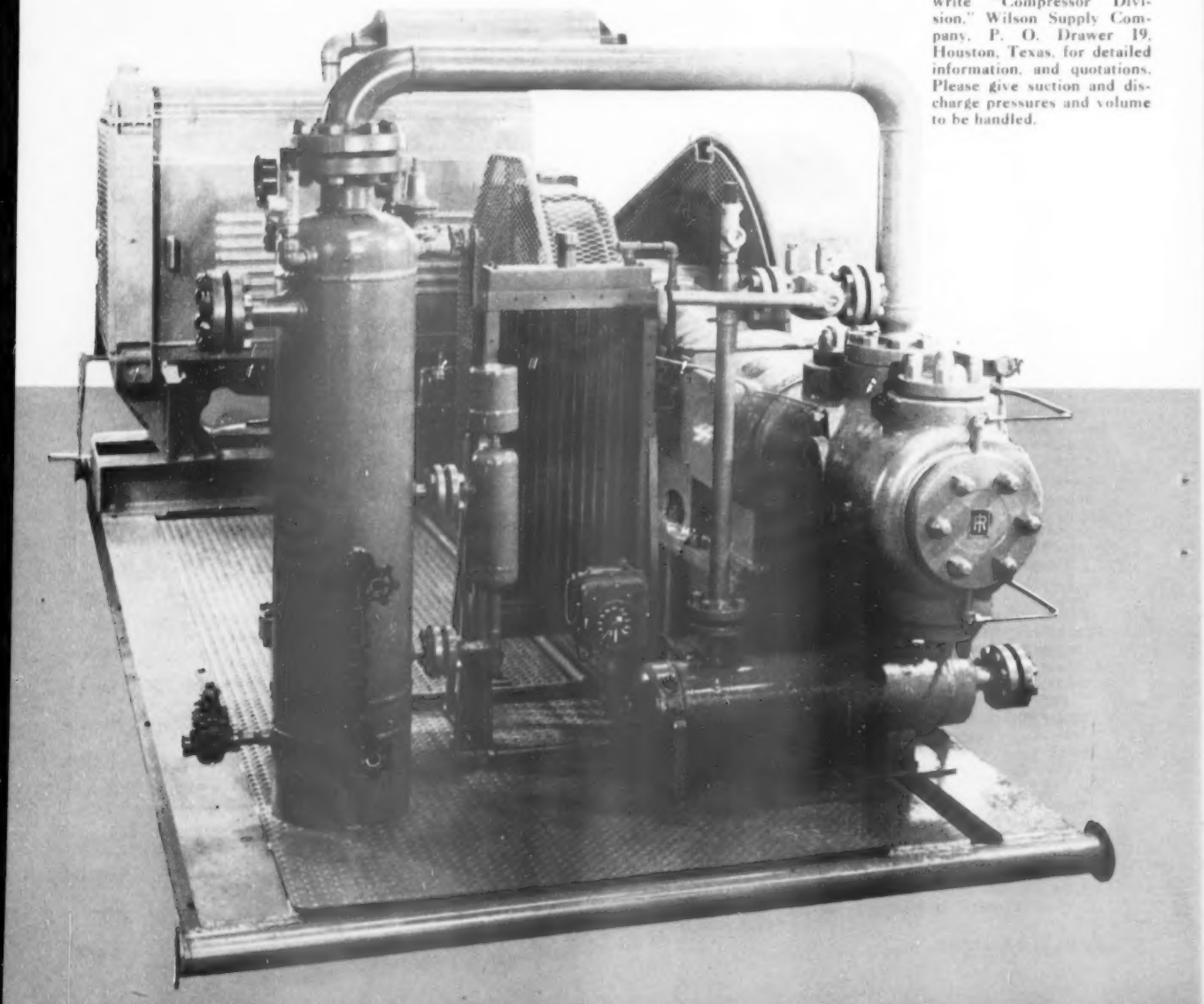
*Gas injection conducted.

WILSON SUPPLY

INGERSOLL-RAND
Packaged Portable
COMPRESSORS • • • Engineered • •

The Compressor Division of the Wilson Supply Company includes a completely equipped "Fabricating Shop". It is here that Wilson Supply—Ingersoll-Rand packaged portable compressors are fabricated, mounted on heavy skids and readied for immediate service in the field. The experience gained through the fabricating of many hundreds of these units has proven of great value in assuring maximum trouble free performance.

Contact your nearest Wilson Supply Company Store or write "Compressor Division," Wilson Supply Company, P. O. Drawer 19, Houston, Texas, for detailed information, and quotations. Please give suction and discharge pressures and volume to be handled.



UP to A HIGH STANDARD OF PERFORMANCE

not DOWN TO A PRICE . . .

The economical Field Compressor installation is the one that does the job it is meant to do—does it continuously over a long period; and requires the minimum amount of repairs and servicing.

Wilson Supply—Ingersoll-Rand Packaged Portable Compressor installations are engineered to give the operator this standard of performance.

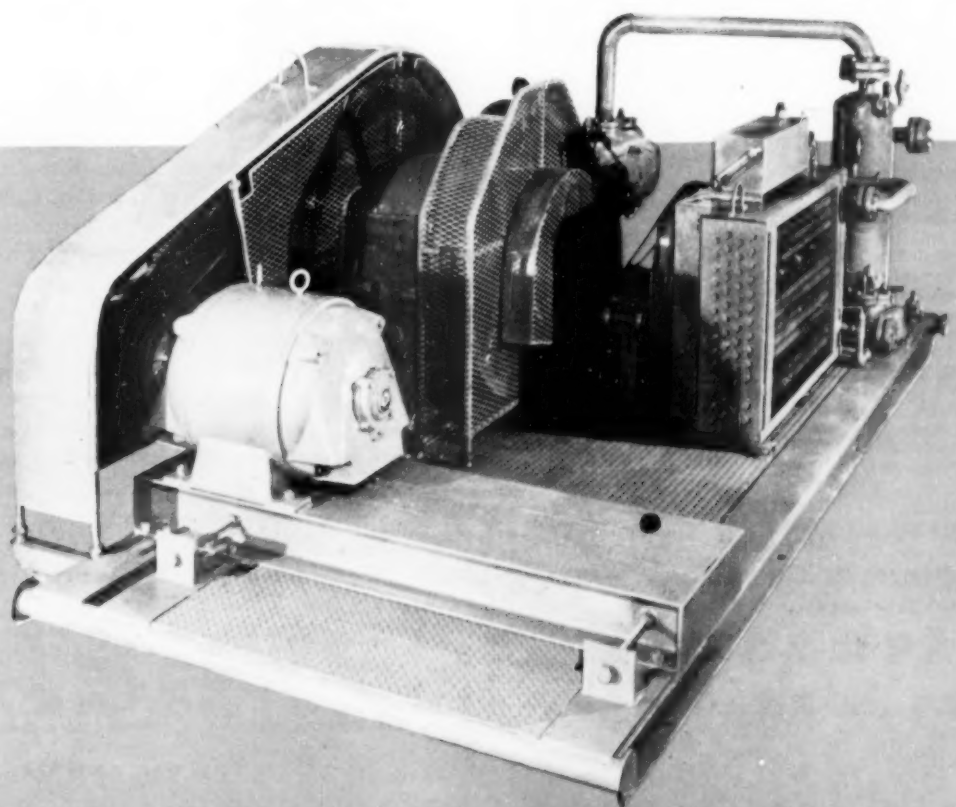
Furthermore—service engineers of Wilson Supply Company are available should they be needed—to keep shut-down time to a minimum.

WILSON SUPPLY COMPANY

BRANCH STORES
TEXAS—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans. LOUISIANA—Lake Charles, New Iberia, Houma, Harvey, Shreveport.

1301 Conti Street
HOUSTON, TEXAS

SALES OFFICES
DALLAS
TULSA
SHREVEPORT
NEW ORLEAN
LAKE CHARLE
CORPUS CHRIS



Survey of Field Processing Plants

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Belgian Anticline, Kern (Taft)	8	9,000	None
Del Valle, Ventura (Saugus)	32	43,000	20,000
Grimes Canyon, Ventura (Santa Paula)	3	3,500	None
West Coast Refining Co.:			
Richfield, Orange (Placentia)	35	27,000	None
Wilmington Gasoline Co.:			
Wilmington, Los Angeles (Long Beach)	50	65,000	60,000
Total	1,747	2,299,864	1,116,130
COLORADO			
The California Co.:			
Rangely, Rio Blanco (Craig)*	45	40,000	40,000
Mountain Fuel Supply Co.:			
Hiawatha, Moffat	15	972	None
Powder Wash, Moffat	15	3,377	None
Total	75	44,349	40,000
ILLINOIS			
Brenneman & MacDonnell:			
Sarah Dee, Crawford (Oblong)	0.25	150	None
Frank Condrey, Crawford (Oblong)	0.05	20	None
Carter Oil Co.:			
Loudon, Fayette (St. Elmo)*	14	11,000	33,000
The Texas Co.:			
Hoodville, Hamilton (McLeansboro)	7	14,000	63,000
Salem, Marion (Salem)	10	44,300	124,000
Warren Petroleum Corp.:			
Salem	2	16,000	21,000
Crossville	5	10,000	37,000
Total	38	95,470	278,000
KANSAS			
Cities Service Oil Co. (Del.):			
Pampa and Houghton, Sedgwick (Wichita)	172	58,000	36,000
Burrton-Stone, Reno (Burrton)	5	11,000	11,000
Colorado Interstate Gas Co., Inc.:			
Hugoton, Kearney (Lakin)	215	40,000	None
Deerfield Petroleum, Inc.:			
Hugoton, Finney (Deerfield)	110	14,183	7,335
Flynn Oil Co.:			
Otis	10	5,500	400
Hugoton Production Co.:			
Ulysses	90	29,000	43,000
Kansas Power & Light Co.:			
Barber, Medicine Lodge	48	15,000	None
Magnolia Petroleum Co.:			
Hickok, Grant (Ulysses)	134	16,670	13,200
Northern Natural Gas Co.:			
Hugoton, Steward (Sublette)	280	57,935	None
Hugoton, Finney (Holcomb)	185	11,232	None
Panhandle Eastern Pipe Line Co.:			
Hugoton, Seward (Liberal)	158	48,450	19,012
Skelly Oil Co.:†			
Hugoton, Kingman*	10	20,000	
Stanolind Oil & Gas Co.:			
Hugoton, Grant, Stanton, Morton, and Stevens (Ulysses)	325	86,000	197,000
The Texas Co.:			
Atlanta, Cowley (Burden)*	3	4,500	2,900
Total	1,745	417,470	329,847
KENTUCKY			
Kentucky West Virginia Gas Co.:			
Floyd, Dwale	40	8,000	None
Tennessee Gas Transmission Co.:			
Gabe	900	60,000	360,000
United Gas Fuel Co.:			
Boyd	100	25,000	30,000
Martin	40	15,000	25,000
Total	1,080	108,000	415,000

LOUISIANA

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Acadia Corp.:			
Egan, Crowley	115	75,000	40,000
Amerada Petroleum Corp.:			
Lake Chicot, St. Martin's (Baton Rouge)	3	2,100	
Anchor Gasoline Corp.:			
Avoyelles, Eola	31	13,300	12,200
Evangeline, Easton	14	7,700	6,200
Rapides, Cheneyville	3	2,600	None
Acadia, Eunice	27	5,000	13,000
Anse LaButte Gasoline Corp.:†			
Anse LaButte, St. Martin's		11,970	
Arkansas Fuel Oil Corp.:			
Homer, Claiborne (Homer)*	0.6	2,500	None
Arkansas Louisiana Gas Co.:			
Bistineau, Webster, Shreveport)	60	36,000	10,000
North Ruston, Lincoln (Ruston)	50	20,000	20,000
Rodessa, Caddo (Vivian)	10	12,000	1,500
Shreveport, Caddo (Shreveport)	8	11,000	900
Sligo, Bossier (Shreveport)	60	21,000	10,000
Waskom, Harrison (Shreveport)	145	90,000	45,000
Arkla Oil Co.:			
North Rodessa (Caddo)*	8	7,320	3,240
Atlantic Refining Co.:			
Neale, Beauregard (Merryville)	22	12,676	8,530
Bates & Connell:			
South Bayou Mallett, Acadia Eunice)	10	12,000	5,000
Bel Oil Corp.:			
North Elton, Elton	15	20,000	None
The California Co.:			
Hico Knowles, Lincoln (Ruston)	70	53,000	45,000
Claiborne Gasoline Co.:			
Lisbon, Claiborne	150	60,000	30,000
Continental Oil Co.:			
Gillis, Calcasieu (Lake Charles)	29	12,600	None
Tepetate, Acadia (Basile)*	25	13,300	None
Ville Platte, Evangeline (Ville Platte)*	120	59,800	26,000
Great National Oil Corp.:†			
Caddo, Ida		35,070 (est.)	
Gulf Oil Corp.:			
Homer, Claiborne (Homer)	2	6,420	None
Haynesville Operators Committee:			
Haynesville, Claiborne (Haynesville)*	21	30,000	7,000
Humble Oil & Refining Co.:			
St. Landry, Opelousas	170	58,140	60,350
Magnolia Petroleum Co.:			
Mamou, Evangeline, (Mamou)	4	11,752	8,064
Hurricane Creek, Beauregard (Longville)	2	7,526	2,163
Mississippi River Fuel Corp.:			
Morehouse, Monroe	300	5,500	
Ohio Oil Co.			
Haynesville, Claiborne (Haynesville)	10	3,740	1,960
Shell Oil Co.:			
Iowa, Calcasieu (Iowa)	10	5,000	None
Stanolind Oil & Gas Co.:			
Pine Island, Caddo (Gilliam)	1	2,100	None
Sun Oil Co.:			
Delhi, Richland (Delhi)	17	25,000	50,000
Sunray Oil Corp.:			
West Tepetate, Jefferson Davis (Elton)*	20	32,000	None
The Texas Co.			
Lafitte, Jefferson (Lafitte)	22	14,000	None
Paradis, St. Charles (Paradis)	115	36,500	59,000
Union Sulphur and Oil Corp.:			
Welsh, Jefferson Davis	10	4,200	None

*Gas injection conducted. †Combined natural gasoline and L.P.G.

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

One moving part.

No internal wearing parts.

No valves, pistons, or sliding vanes.

No internal lubrication.

Low maintenance.

Slugs of liquid entering pump do no harm.

Non-pulsating pressure.

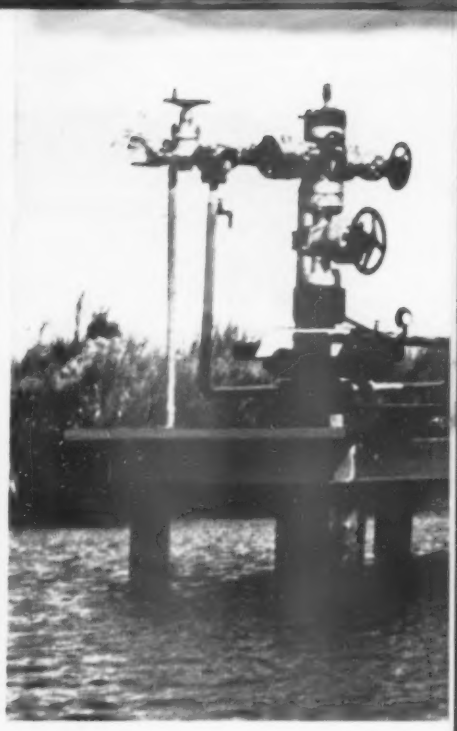
Saves floor space.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

274 WILSON, SO. NORWALK, CONN.

In one of the world's deepest producing wells...

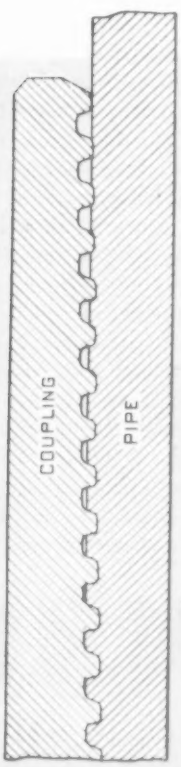


673,000 lbs. NATIONAL

Gonsoulin-Minvielle State Unit No. 2. On completion, the well flowed at a daily rate of 141 barrels of 42.5° gravity condensate and 4,293,000 cubic feet of gas through a 24-64-inch choke. Eight of the world's 10 deepest producing oil wells are at Weeks Island.

Roustabout Gang setting up test equipment for the well. The equipment was all connected up on a barge and moved to the well ready for operation.

BUTTRESS THREADS AND COUPLINGS



Two world record-breakers, 1000 yards apart. In the foreground, the Christmas tree of a former record holder—Weeks-Gall Unit No. 1. In the background, Shell's Gonsoulin-Minvielle State Unit No. 2.

# of casing were supported by BUTTRESS-THREAD CASING.

IN drilling the Gonsoulin-Minvielle State Unit No. 2, at Weeks Island Field, 15 miles south of New Iberia, Louisiana, Shell Oil Company has accomplished feats believed unprecedented in the oil industry. Among them:

- Set a new depth record for commercial production — 17,260 to 17,306 feet.
- Drilled over 17,000 feet of hole in 90 days' time.
- Cut more than 1,000 feet of hole below 14,000 feet in 30 days' time.
- Drilled to 14,000 feet and 9⅝ inch casing set in only 32 days, with *no* difficulties encountered.

"No difficulties encountered"—even at the total depth of 18,568 feet.

And for good reason. The top of the 14,000 feet of 9⅝ inch casing was 4,300 feet of NATIONAL N-80 Buttress-Thread Casing — carrying the load. Engineering acumen? Careful planning? To be sure! Both revealed in the choice of the *right* material—NATIONAL SEAMLESS.

NATIONAL Buttress-Thread Casing is made to order for a job like this. It was especially developed to satisfy the petroleum industry's need for a casing joint which would support the tremendous weight of long strings of deep-well casing with safety and economy. The high tensile strength of the buttress-thread joint is due largely to the combined effect of the completely engaged runout threads and the three degree flank angle of the thread which support the weight of the casing in the well. The joint, in fact, is comparable in strength to that of the body of the pipe. The buttress-thread casing eliminates the need for upset end casing—gives greater inside clearance for the drilling bit. Moreover, it permits easy, faster coupling to power-tight position.

For further information on National Tube developments in the oil industry, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION
PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

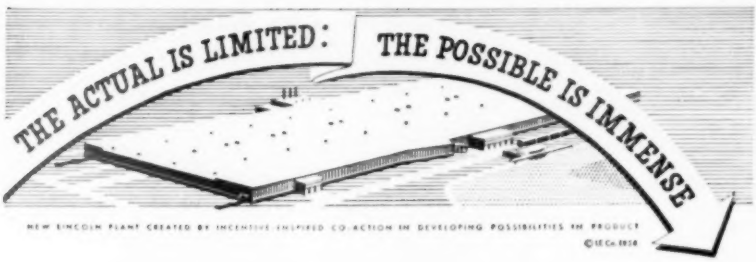
NATIONAL USS SEAMLESS
DRILL PIPE . . . CASING . . . TUBING

UNITED STATES STEEL

Survey of Field Processing Plants

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
South Lewisburg, Arcadia (Church Point)	10	6,000	None
United Gas Pipe Line Co.:			
Koran	60	18,000	4,000
Rodessa	50	50,000	4,000
Sugar Creek	30	20,000	3,000
Total	1,830	931,814	476,107
MICHIGAN			
Dow Chemical Co.:			
Beaver Creek, Crawford (Grayling)	4	9,400	None
Total	4	9,400	None
MISSISSIPPI			
The California Co.:			
Brookhaven, Lincoln (Brookhaven)*	18	8,000	10,000
Total	18	8,000	10,000
MONTANA			
Union Oil Co. of California:			
Cut Bank, Glacier (Cut Bank)*	65	12,000	18,000
Total	65	12,000	18,000
NEBRASKA			
Ohio Oil Co.:			
Huntsman, Cheyenne (Sidney)	13	7,400	17,500
Total	13	7,400	17,500
NEW MEXICO			
El Paso Natural Gas Co.			
Jal No. 1 Plant, Lea (Jal)	100	32,000	4,000
Jal No. 2 Plant, Lea (Jal)	50	67,699	15,400
Jal No. 4 Plant, Lea (Jal)	185	86,000	56,080
San Juan River Plant, San Juan (Farmington)	70	25,618	28,726
Wingate Plant, McKinley (Gallup)	†179	89,200	98,780
Frontier Natural Gasoline Co.:			
Grayburg-Jackson, Eddy (Low Hills)	8	6,000	15,000
Gulf Oil Corp.			
Drinkard, Lea (Eunice)	55	51,500	* 75,000
Phillips Petroleum Co.:†			
Eunice, Lea (Oil Center)	140	112,000	
Hobbs-Vacuum, Lea (Hobbs)	42	85,000	
Skelly Oil Co.:‡			
Eunice, Lea	150	200,000	
Southern Union Gas Co.:			
Kutz Canyon, San Juan (Bloomfield)	20	6,667	11,078
Valley Gas Corp.:			
Eddy (Loco Hills)*	5	4,000	9,000
Warren Petroleum Corp.:			
(Monument)	62	28,000	31,000
Total	1,066	793,684	344,064
OHIO			
The East Ohio Gas Co.:			
Cuyahoga, Highland Heights	17	2,550	None
Ohio Fuel Gas Co.:			
Medina	15	2,000	None
Total	32	4,550	None
OKLAHOMA			
Apache Gasoline Co.:			
Apache, Caddo (Apache)	2	2,000	6,000
West Brock, Carter (Apache)	4	5,000	10,000
Carter Oil Co.:			
Fitts Pool, Pontotoc (Fittstown)	9	12,000	29,500
Seminole pool, Seminole (Seminole)*	7	17,000	29,500
Cromwell, Seminole (Cromwell)	6	14,000	13,000
Cities Service Oil Co. (Del.)			
Oklahoma City, Oklahoma (Oklahoma City)*	7	12,000	2,000
Houghton, Texas (Guymon)		11,000	
Various, Osage (Tallant)	104	5,000	
Houghton, Kay (Blackwell)	155	57,000	133,000
Frame Natural Gasoline Co.:			
Osage, Cleveland		2,000	None
Otha H. Grimes			
Pauls Valley, Garvin (Pauls Valley)	5	5,000	10,000
Grimes Gasoline Co.:			
Wetumka, Hughes (Wetumka)	15	5,000	5,000
Charles W. & Otha H. Grimes			
Weleetka, Okfuskee (Weleetka)	15	8,000	4,000
Okemah, Okfuskee (Okemah)	1	1,000	None
Gulf Oil Corp.:			
Glenn Pool, Creek (Kiefer)*	17	26,800	None
Highway Gasoline Co.:			
Middle Peck, Lincoln (Stroud)	3	5,000	5,000
Hugoton Plains Oil & Gas Co.:			
Hugoton, Texas		95,960 (est.)	
Keener Oil Co.:			
Butler	35	1,570	16,000
Kerr-McGee Oil Industries, Inc.:			
Pontotoc, Fittstown	4	6,048	7,224
Creek, Milfay	10	6,006	11,298
Lincoln, Cushing	3	3,696	5,418
Lone Star Gas Co.:			
Harmon, Hollis	60	7,000	12,000
Garvin, Katie	25	14,000	None
Gasoline Plant Management Co.: (Managing Lucien Unit Plant)			
Lucien, Noble (Perry)	8	10,000	20,000
Magnolia Petroleum Co.:			
Graham, Carter (Fox)	17	18,400	10,465
Sholem Alechem, Stephens (Countyline)	40	30,486	51,814
Davenport, Lincoln (Davenport)	2	7,650	1,921
St. Louis, Pottawatomie (St. Louis)	2	5,640	5,257
Mid-Continent Petroleum Corp.:			
Sawyer, Drumright	2	5,806	2,819
Cromwell	4	10,957	8,415
Stillwater	3	3,783	2,173
Moore	10	6,748	6,932
Moran Gasoline Corp.:			
Kendrick, Lincoln	9	10,000	10,000
Neal Gasoline Co.:			
Osage	6	4,700	None
Panoma Corp.:			
Hugoton, Texas (Guymon)		106,720 (est.)	
Patton & Swab			
Edmond, Oklahoma (Edmond)	18	10,000	7,000
Phillips Petroleum Co.:‡			
Burbank, Osage (Shidler)	15	42,000	
Burbank, Osage (Fairfax)	8	32,000	
Edmond, Oklahoma (Edmond)	130	164,000	
Oklahoma City, Oklahoma (Oklahoma City)	16	55,000	
Wewoka, Seminole (Wewoka)	6	27,000	
Edmond, Oklahoma (Edmond)	65	75,000	
Pure Oil Co.:			
Glenn Pool, Creek (Sapulpa)*	4	5,500	None
Shell Oil Co. Barco Plant: (Harry Ells Inc., Operator)			
Carter, Healdton	3	4,000	5,000
Shell Oil Co.:			
Hewitt, Carter (Wilson)	7	11,300	11,700

*Gas injection conducted. †Gas absorption at Blanco field, Farmington. ‡Combined natural gasoline and L.P.G.



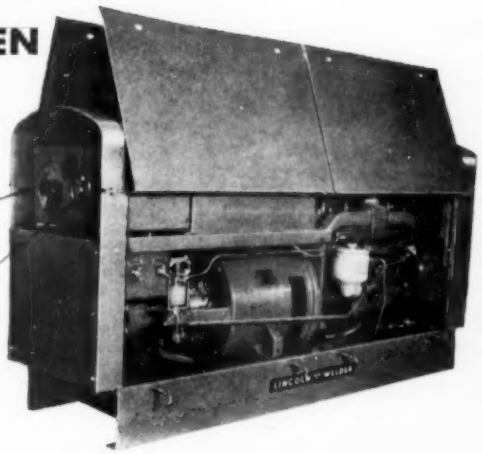
NEW LINCOLN PLANT CREATED BY INCENTIVE INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

©LECo.1954

LINCOLN "SHIELD-ARC" SAE ENGINE DRIVEN WELDER

JOB SELECTOR
Sets right *type* arc

CURRENT CONTROL
Sets right arc *intensity*



RIGHT COMBINATION of arc and intensity CUTS WELDING COSTS

Why compromise for speed... ease of welding? Lincoln's Dual Continuous Control sets both the arc *type* and arc *intensity* to the exact needs of each job . . . to give you faster, easier welding.

YOU BENEFIT with top quality welds...every time...regardless of position, material or type of electrode. You get more footage ... lower cost per foot on pipelines, refinery or structural work.

Only Lincoln has the Dual Continuous Control.

GET FACTS ON CUTTING COSTS
Bulletin 1337 giving complete specifications on "Shield-Arc" engine driven welders is available by writing

ON THE LINE—Lincoln "Shield-Arc" engine driven welders speed double jointing with Automatic Lincolnweld.

ON CONSTRUCTION—dependable, high quality welds on high tensile and alloy pipe simplify refinery operations . . . at low cost.

ON MAINTENANCE—fast, efficient welding in all positions . . . flat, vertical or overhead, because the operator sets right *type* of arc and arc *intensity* with Lincoln's Dual Continuous Control.

THE LINCOLN ELECTRIC COMPANY

Dept. 5102
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Survey of Field Processing Plants

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Sinclair Oil & Gas Co.:†			
Creek (Drumright)		155,000	
Garfield (Covington)		100,000	
Seminole (Seminole)		§50,000	
Seminole (Seminole)		210,000	
Pottawatomie (St. Louis)		§30,000	
Skelly Oil Co.:			
South Burbank (Osage)	10	30,000	
Velma, Stephens	85	120,000	
Sohio Petroleum Co.:			
West Edmond, Kingfisher (Edmond)	12	5,000	5,000
Eola, Garvin (Elmore)	13	7,500	8,500
Sokla Gasoline Co.:			
Fox-Graham, Carter (Fox)	7	7,000	7,000
Sterling Oil Co.:			
East Springvalley, Garfield (Garver)	10	10,000	5,000
Sunray Oil Corp.:			
Osage (Avant)	1	2,000	None
The Texas Co.:			
Davenport, Lincoln (Davenport)	12	14,700	10,500
Moore, Z., Creek (Kiefer)*	2	5,300	700
Warren Petroleum Co.:			
(Maud)	8	12,000	18,000
(Madill)	10	15,000	21,000
(Maysville)*	225	152,000	225,000
(Ringwood)*	32	22,000	25,000
Total	1,289	1,916,270	768,136
PENNSYLVANIA			
Equitable Gas Co.:			
Greene, Rogersville	25	2,816	None
Mars Co.:			
Venango, Van		911	2,445
Venango, Pinegrove		1,979	None
McKean, Lewis Run		1,787	None
Pennsylvania Oil Co.:			
Ludlow, Warren (Roystone)	20	4,000	None
Peoples Natural Gas Co.:			
Brave	100	10,000	None
Total	145	21,493	2,445
TEXAS			
J. S. Abercrombie Co., Old Ocean:			
Brazoria and Matagorda (Sweeny)*	350	137,577	201,212
Amarillo Oil Co.:			
West Panhandle, Potter (Masterson)	75	16,000	8,000
West Panhandle, Potter (Fritch) (This plant formerly owned by West Texas Gas Co.)	70	13,500	4,000
Arkansas-Louisiana Gas Co.:			
East Carthage, Panola (Carthage)	40	26,000	10,000
Jefferson, Marion (Jefferson)	31	24,000	3,000
Rodessa, Marion (Jefferson)	12	13,000	None
Anchor Gasoline Corp.:			
Tex-Harvey Gasoline plant (joint venture with Anchor the operator)			
Spraberry, Midland (Midland)	35	29,000	71,000
Arkansas Fuel Oil Corp.:			
East Texas, Gregg (Greggton)	10	26,000	63,000
West Carthage, Panola (Carthage)	100	50,000	28,000
The Atlantic Refining Co.:			
Block 31, Crane (Crane)*	33	17,466	None
Barnhart Hydrocarbon Corp.:			
Barnhart, Reagan (Big Lake)	25	13,700	61,800
Black Hawk Gasoline Corp.			
Alco-Caddo, Jack (Graham)	5	5,000	None
Bowie Gasoline Co.:			
Various, Montague (Bowie)	20	20,000	40,000
Breckenridge Gasoline Co.:			
Eliasville, Stephens (Breckenridge)	7	7,500	5,500
Rodessa, Cass (Atlanta)	20	11,000	2,200
Cabot Carbon Co.:			
Estes, Ward (Wickett)	30	23,430	6,660
Keystone, Winkler (Kermit)	13	11,785	None
Walton, Winkler (Kermit)	24	22,480	9,345
Carthage Co.:			
Panola (Carthage)	400	250,000	160,000
Caska Corp.:			
Quitman, Wood (Quitman)	3	5,000	10,000
Charleston Petroleum, Inc.:			
Yates, Andrews (Andrews)	8	2,500	1,400
The Chicago Corp.:			
Panola (Carthage)	210	142,884	99,204
Cities Service Oil Co. (Del.)			
Pampa, Gray (Pampa)*	36	50,000	27,000
Chico, Wise (Chico)	25	21,000	34,000
Colorado Interstate Gas Co., Inc.			
West Panhandle, Moore (Fourway)	150	85,000	15,000
West Panhandle, Moore (Bivins)	165	55,000	None
Coltexo Corp.:			
Gary (Lefors)	60	30,000	None
Columbian Gasoline Corp.:			
Wheeler (Shamrock)	40	6,000	None
Continental Oil Co.:			
Rincon, Starr (Rio Grande City)*	20	27,200	7,600
KMA, Wichita (Electra)*	35	72,100	None
Todd Ranch, Crockett (Big Lake)	9	9,900	24,700
Denton Oil Co.:†			
Benedum, Upton (Rankin)	83	110,000	
Duval Gasoline Co.:			
Duval (Benavides)*	8	5,000	3,000
El Paso Natural Gas Co.:			
Ward (Monahans)	20	16,536	25,200
Etexas Producers Gas Co.:			
Chapel Hill, Smith (Tyler)	10	9,000	5,000
Goliad Corp.:‡			
Kittie, Live Oak (George West)	65	45,000	70,000
Otha H. Grimes			
Eskota, Fisher (Trent)	1	2,500	3,500
Ringgold, Clay (Ringgold)	2	5,000	7,500
Gulf Oil Corp.:			
(Waddell, Sand Hills, Henderson, University and Ellenburger), Crane (Crane)	40	35,000	53,000
North Ward, Ward (Monahans)*	25	21,000	None
Gulf Oil Corp.-Gulf Refining Co.:			
East Texas, Rusk (Overton)	5	8,460	9,950
East Texas, Gregg (Kilgore)	15	34,220	63,100
Frank C. Henderson Trust No. 2			
West Panhandle, Hutchinson (Sanford)	50	18,000	None
Honolulu Oil Corp.:			
Hockley (Ropes)	2	20,160	13,440
J. M. Huber Corp.:			
Hutchinson (Borger)	70	33,000	None
Humble Oil & Refining Co.:			
Anahuac, Chambers (Monroe City)	100	46,200	None
Clear Lake, Harris (Genoa)	125	30,450	36,540
Conroe, Montgomery (Conroe)	29	70,560	30,240
East Texas, Rusk (Overton)	24	50,400	231,000
Flour Bluff, Nueces (Corpus Christi)	12	5,740	None
Heyser, Calhoun (Bloomington)	16	8,400	None
Pickton, Hopkins (Pickton)*	49	30,610	66,130
Tomball, Harris (Tomball)	46	37,800	None

*Gas injection conducted. †Combined natural gasoline and L.P.G. ‡Handles liquids from two other plants which process 90 million cubic feet of gas daily. §No L.P.G. produced.

The Petroleum Industry

STOPS RUST! with RUST-OLEUM

The Practical Way to Save Pipes, Tanks, Derricks, Buildings, Pumps, Roofs, Fences

Ask the maintenance men who battle rust daily! They'll tell you that RUST-OLEUM is the practical answer. (1) It may be applied directly over surfaces *already rusted* without removing all the rust. Wirebrushing and scraping with sharp scrapers to remove rust scale and loose particles is all that is usually required . . . eliminating costly sandblasting and chemical pre-cleaning . . . often enabling one man to do the work of two. (2) RUST-OLEUM *beautifies as it protects in all colors, aluminum, and white.* (3) RUST-OLEUM *stops rust* on every rustable metal surface indoors and out.

See how RUST-OLEUM can cut your maintenance costs. Prompt delivery from Industrial Distributor stocks in principal cities in the United States and Canada.

RUST-OLEUM CORPORATION
2545 Oakton Street • Evanston, Illinois

RUST-OLEUM

May be applied directly over rusted surfaces without removing all the rust!
Available in All Colors, Aluminum and White

CLIP THIS TO YOUR LETTERHEAD
MAIL TO: RUST-OLEUM CORPORATION
2545 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
- ☐ Complete Literature
- ☐ Nearest RUST-OLEUM Source

Survey of Field Processing Plants

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Tomoconnor, Refugio (Refugio)	35	19,320	41,160
Jourdanton, Atascosa (Jourdanton)	26	31,290	18,270
H. L. Hunt			
Whelan, Harrison (Harleton)	40	25,000	4,000
Ibex Co.:			
Eastland (Eastland)	10	6,500	6,500
Shackelford County	10	3,000	3,000
Kerr-McGee Oil Industries, Inc.:			
Gray (Pampa)	23	23,268	18,489
Moore (Cactus)	50	42,000	None
LeBus Brothers:			
Strawn, Loving (Loving)*	2	4,200	3,200
Lion Oil Co.:			
Diamond M, Sharon Ridge, Scurry (Snyder)	50	84,500	229,000
Lone Star Producing Co.:			
Wilshire Ellenburger, Upton (Crane)	12	5,000	20,000
Ft. Chadbourne, Runnels (Bronte)*	30	15,000	45,000
Eastland (Ranger)	None	35,000	32,000
Breckenridge, Stephens (Breckenridge)	10	15,000	None
Ranger, Eastland (Ranger)	15	35,000	None
Opelika, Henderson (Murchison)*	80	45,000	11,000
Carthage, Panola (Carthage)*	100	21,000	None
Lone Star Gas Co.:			
Trinidad (Henderson)	200	24,000	15,000
Springtown (Parker)	100	20,000	25,000
Gordon (Palo Pinto)	75	12,000	10,000
Pueblo (Eastland)	40	8,000	None
C. V. Lyman Gasoline Co.:			
Emperor, Winkler (Wink)	15	6,000	6,000
Magnolia Petroleum Co.:			
Burkburnett, Wichita (Burkburnett)	1	7,400	5,400
Desdemona, Eastland (Desdemona)	1	7,650	1,900
Electra, Wilbarger (Electra)	0.68	3,900	1,800
Olden, Eastland (Olden)	0.47	2,470	520
Pegasus, Midland (Midland)	60	46,810	66,900
Vanderbilt, Jackson (Vanderbilt)	76	38,510	6,537
East Texas, Gregg (Kilgore)	11	27,403	40,042
Kermit, Winkler (Kermit)	10	3,850	5,536
Martinpool Gasoline Co.:			
Andrews (Andrews)	4	4,535	9,844
Nash Gasoline Co.:			
James (Young)	4	3,000	2,000
South Bend, Young	6	3,500	2,200
Natural Gas Pipeline Co. of America:			
Panhandle, Hutchinson (Fritch)	192	115,260	None
Panhandle, Moore (Stinnett)	180	83,960	None
Natural Gasoline Corp.:			
East Texas, Smith (Hawkins)	22	28,000	92,000
Odessa Natural Gasoline Co.:			
Foster & South Cowden, Ector (Odessa)	30	20,000	20,000
Ohio Oil Co.:			
North Markham, Matagorda (Bay City)*	102	None	28,400
Panoma Corp.:			
Cargray, Carson		114,000 (est.)	
Parade Co.			
East Texas, Rusk (Overton)	15	45,000	66,000
Phillips Petroleum Co.:†			
KMA, Wichita (Electra)	5	30,000	
West Panhandle, Moore (Phillips)	210	145,000	
East Panhandle, Gray (Pampa)	80	107,000	
East Panhandle, Gray (Pampa)	45	50,000	
East Panhandle, Gray (Pampa)	10	43,000	
East Panhandle, Gray (Pampa)	60	76,000	
West Panhandle, Hutchinson (Phillips)	20	41,000	
West Panhandle, Hutchinson (Phillips)	50	57,000	
West Panhandle, Hutchinson (Phillips)	240	203,000	
West Panhandle, Hutchinson (Phillips)	100	132,000	
West Panhandle, Moore (Phillips)	260	167,000	
West Panhandle, Hansford (Guymon)	140	106,000	
West Panhandle, Hansford (Guymon)	380	220,000	
McElroy, Crane (Crane)	40	55,000	
Fullerton, Andrews (Andrews)*	75	225,000	
Goldsmith, Ector (Goldsmith)*	250	600,000	
Harper-Penwell-Jordan, Ector (Penwell)	25	50,000	
Seminole, Gaines (Seminole)	33	47,000	
Tex-Harvey, Midland (Spraberry)	76	200,000	
Pembrook, Upton (Midkiff)	40	130,000	
Chocolate Bayou, Brazoria (Alvin)	360	300,000	
Pure Oil Co.:			
Andrews (Dollarhide)	50	98,000	102,000
Van Zandt (Van)	8	39,000	14,800
Reef Fields Gasoline Corp.:			
East Vealmoor, Howard (Big Spring)	35	56,000	240,000
Renwar Oil Corp.:			
Mustang Island, Nueces (Corpus Christi)	50	60,000	None
Mustang Island, Nueces (Corpus Christi)	4	200	None
Sid Richardson Gasoline Co.:			
Keystone, Winkler (Kermit)	150	55,000	120,000
Rowan & Hope:			
Strawn Reef, Nolan (Sweetwater)	5	3,475	1,058
Runnels Gas Products Corp.:			
Cree-Sykes, Runnels (Ballinger)	23	21,000	52,500
Shamrock Oil & Gas Corp.:			
Panhandle, Moore (Sunray)	400	128,000	302,400
Shell Oil Co.:			
TXL, Ector (Notrees)	92	109,100	182,100
Wasson, Yoakum (Denver City)	130	145,500	163,700
Panhandle, Carson (Skellytown)	11	18,200	None
Provident City, Lavaca, (Sheridan)	69	72,000	13,700
Sinclair Oil & Gas Co.:†			
East Texas, Gregg (Longview)		225,000	
Rusk-Smith (Troup)		100,000	
San Patricio (Taft)		30,000	
Rusk (Price)		130,000	
Skelly Oil Co.:†			
Panhandle, Hutchinson, Carson and Gray*	85	260,000	
South-Tex Corp.:			
Agua Dulce, Nueces (Robstown)*	80	35,000	28,000
Southern Minerals Corp.:			
Sacet, Nueces (Corpus Christi)	16	8,000	2,000
Stratton, Nueces (Bishop)*	50	22,000	14,000
Southern Production Co., Inc.:			
Pledger, Brazoria	190	(§)	
Standard Oil Co. of Texas			
Sivells Bend, Cooke (Gainesville)	5	8,000	7,000
Kelly-Snyder, Scurry (Snyder)*	30	60,000	90,000
Stanolind Oil & Gas Co.:			
Hastings, Brazoria and Galveston (Alvin)	53	28,000	32,000
La Rosa, Refugio (Woodsboro)	50	44,000	6,000

*Gas injection conducted. †Combined natural gasoline and L.P.G. §Plant recently completed. No figures given.

Check the SAFETY ZONE

Yes . . . check the safety zone before ordering valves. Check . . . for voids in the body that could retain fluid when the valve is closed or open.

LISTED UNDER RE-EXAMINATION SERVICE UL OF UNDERWRITERS' LABORATORIES, INC. TYPE "G"

ORBIT VALVES ®

ORBIT Forged Steel LP GAS VALVES are designed so that there are no voids in the body of the Valve, for fluids to become trapped that could feed a fire or contaminate a different product. When the valve is closed it drains clean.

Your Supply Store carries ORBIT Forged Steel Valves in stock. Sizes 1" to 4". ASA Ratings 150 lb. Class to and including ASA 2500 lb. Class. Screwed and Flanged Ends. Maximum Rated Working Temperature 250° Fahrenheit.

BRANCHES

HOUSTON, TEXAS, 407 Velasco
(Serving the Gulf Coast)
ODESSA, TEXAS, 402 West County Road
(Serving West Texas)
CASPER, WYOMING, 247 W. First Street
(Serving the Rocky Mountain States and Canada)

ORBIT VALVE COMPANY

P. O. BOX 699 **TULSA, OKLA.**

Survey of Field Processing Plants

Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Levelland, Cochran and Hockley (Levelland)	40	62,000	72,000
Luby and Petronilla, Nueces (Bishop)*	37	34,000	21,000
North Cowden, Andrews and Ector (Odessa)*	55	71,500	93,500
Slaughter, Field, Cochrane and Terry (Sundown)	110	121,000	175,000
Fullerton, Andrews (Andrews)	44	58,000	248,000
Three Bar, Andrews (Kermit)*	18	26,000	65,000
Stonewall Gas Products Co.:			
Various, Stonewall (Knox City)	15	20,000	40,000
Sun Oil Co.			
Jameson, Coke (Colorado City)*	50	40,000	50,000
Sun, Starr (Delmita)	50	45,000	50,000
Sunray Oil Corp.:			
Kelly-Snyder, Scurry (Snyder)	78	670,000	
Taylor Oil & Gas Co.:			
McAllen, Hidalgo (McAllen)*	162	110,000	38,000
Tennessee Production Co.:			
Reno Strawn, Archer (Holliday)*	5	6,500	None
Colorado (Eagle Lake)	80	25,000	50,000
Duval (Banquette)	120	25,000	60,000
Tex-Harvey Gasoline Plant:			
(See Anchor Gasoline Corp.)			
The Texas Co.:			
Chalk Hill, Archer (Archer City)*	2	2,650	9,700
Electra, Wichita (Electra)	2	10,000	13,000
Fuller, Scurry (Snyder)*	25	50,000	85,500
Texas Gas Corp.:			
Various, Jefferson, Chambers and Orange (Beaumont)	225	140,000	65,000
Texas Natural Gasoline Corp. and subsidiaries:†			
Wimberly Plant (Tye)		100,000	
Walnut Bend Plant (Gainesville)		40,000	
Sandusky plant (Whitesboro)		50,000	
Chalk Hill plant (Archer City)		25,000	
Benedum plant (Rankin)		200,000	
Pembrook (Midkiff)		100,000	
Weiner-Floyd (Midland)		100,000	
Texas Pacific Coal & Oil Co.:			
Caddo, Stephens	6	7,688	5,799
Tide Water Associated Oil Co. (Mid-Cont. Division)			
S. Sinton, San Patricio (Sinton)*	2	1,800	None
Sublime, Colorado (Sheridan)	12	9,700	None
West Bernard, Wharton (East Barnard)	29	28,400	8,100
Yoward, Bee (Mineral)*	4	14,300	None
United Gas Pipe Line Co.:			
(Agua Dulce)	30	45,000	4,000
(Carthage)	220	304,000	96,000
(Karnes City)	10	35,000	15,000
W. T. Waggener Estate			
Wilbarger,* (Vernon)	2	4,100	200
Warren Petroleum Corp.:			
(Fairbanks)*	30	16,000	6,000
(Holliday)*	11	24,000	46,000
(McLean)*	22	41,000	10,000
(Breckenridge)	10	18,000	33,000
(Gladewater)	10	75,000	71,000
(Wichita Falls)	5	14,000	19,000
(Greggton)	10	32,000	90,000
Waskom Natural Gas Corp.:			
Waskom	55	50,400	21,000
West Gasoline Co.:			
Hull-Merchant, Liberty (Daisetta)*	20	‡	‡
D. E. & R. J. Whelan*			
Whelan, Harrison (Marshall)	20	4,000	None
Total	10,207	10,497,897	5,278,967

UTAH

Mountain Fuel Supply Co.			
Clay Basin, Daggett	22	869	None

WEST VIRGINIA

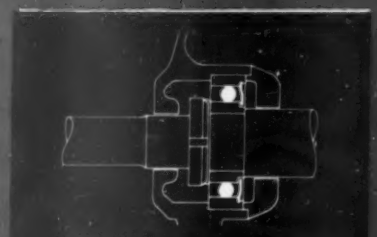
Plant location (field, county, and nearest town)—	Gas cap., M.M.c.f./day	Natural gasoline, gal./day	Total butane and lighter, gal./day
Hope Natural Gas Co.:			
Cornwell, Kanawha (Clendennin)	90	5,670	None
Hastings, Wetzel (New Martinsville)	250	40,000	60,000
Kennedy, Lewis (Weston)	25	8,400	None
Manufacturers Light & Heat Co.:			
Greene, Wetzel (Porter Falls)	20	9,000	None
Owens, Libby-Owens Gas Dept.:			
Kanahwa	25	8,000	None
Pure Oil Co.:			
Kanawha, Cabin Creek	4	3,500	2,400
South Penn Natural Gas Co.:			
Blackshere, Marion (Manningtion)		800	None
Copley, Lewis (Camden)		800	None
Clay, Clay (Newton)		2,500	None
Edgell, Roane (Clover)		1,200	None
Fairview, Monongalia, (Fairview)		3,000	None
Griffith, Lincoln (Yawkey)		2,000	None
Hartley-Stephens, Ritchie (Brohard)		2,600	None
Liverpool, Jackson (Spencer)		500	None
Lynch, Harrison (Wolf Summit)		3,500	None
Metz, Marion (Mannington)		1,200	None
Morgan, Wetzel (Smithfield)		3,000	None
McElroy, Tyler (West Union)		500	None
Oil Siding and Blue Creek, Kanawha (Blue Creek)		500	None
Pine Grove, Wetzel (Pine Grove)		3,500	None
Rock Creek, Roane (Walton)		1,200	None
Shinnston, Harrison (Shinnston)		500	None
Seckman, Tyler (West Union)		500	None
Stringtown, Tyler (West Union)		3,000	None
Sweeney, Tyler (West Union)		500	None
Tanner, Gilmer (Grantsville)		3,000	None
Victor, Kanawha (Pinch)		3,500	None
Bennett, Gilmer (Grantsville)		500	None
Broadwater, Tyler (Middlebourne)		300	None
Coldwater, Harrison (Wolf Summit)		300	None
Prunty, Ritchie (Cairo)		300	None
Wood, Tyler (Sistersville)		1,000	None
United Fuel Gas Co.:			
Ona plant, Cabell	40	10,000	8,000
Sandyville plant, Jackson	50	20,000	10,000
Hubball plant, Lincoln	40	12,000	27,800
Cobb plant, Kanawha	85	20,000	20,000
Elk plant, Kanawha	35	12,000	8,000
Ferrell plant, Kanawha	10	3,480	None
Total	674	192,250	136,200

WYOMING

Continental Oil Co.:			
Lance Creek, Niobrara (Lance Creek)*	27	20,300	31,000
Mountain Fuel Supply Co.:			
Church Buttes (Uinta)	100	34,913	None
Northern Utilities Co.:			
Sand Draw	50	4,000	None
Ohio Oil Co.:			
McFadden, Carbon (Rock River)*	5	1,650	3,540
Pure Oil Co.:			
Worland, Washakie	42	23,500	34,200
Sinclair Oil & Gas Co.:			
Sweetwater, Bairoil	8	12,000	None
Stanolind Oil & Gas Co.:			
Elk Basin, Park (Elk Basin)*	12	17,000	39,000
Salt Creek, Natrona (Midwest)*	25	51,000	42,000
Total	269	164,363	149,740

*Gas injection conducted. †Combined natural gasoline and L.P.G. ‡Plant recently completed. No figures given.

Here's another reason why the NEW L.A. *Line by the Louis Allis Co. is your* BEST *electric motor* BUY



Shaft extension bearing construction used in new L.A. open, drip-proof motors. Note the Louis Allis bearing-cap construction. It locks outer bearing race to cap, inner race to shaft.

New L.A. open drip-proof motor.

A brand-new power package, completely redesigned inside and out

with NEW BEARING CONSTRUCTION

plus

New modern styling
More compact design
New conduit box arrangement
Improved ventilation and better protection
More versatile mounting

HERE'S the locked bearing construction that makes the new L.A. motors even better—gives them extra life, extra dependability. It positions the rotor . . . limits shaft end-play . . . gives you ample V-belt drive capacity. You get factory prelubrication, too, with a new, improved grease-retaining system that saves servicing and maintenance — for years of attention-free operation under most conditions.

That's not all! You get standard bearings in every unit — sizes specially selected to be easily obtainable from local stocks. And there's no need to tear the motor down to get bearing numbers — they're stamped right on the new motor nameplate.

Add this modern, dependable bearing construction to all the other features and you see why the L.A. line is your best motor buy. Get the complete story from your nearby Louis Allis Sales Engineer.

We specialize in SPECIAL MOTORS *and* PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

Vertical NEMA C-flange motor

NEMA D-flange motor

NEMA C-flange motor

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

LA-105

STANOLIND'S BURNELL-NORTH PETTUS cycling plant is typical of the nation's larger cycling plants. It handles up to 166 million cubic feet of gas daily, produces 168,000 gal. of natural gasoline, and 119,000 gal. of total L.P.G. liquids daily.

Nation's Cycling Plants Producing Nearly

Six Million Gallons of Liquids Daily

by John M. McGivern
District Editor

NATURAL gasoline produced in the nation's cycling operations amounts to some 3.7 million gallons per day, while L.P.G. production totals approximately 2.2 million gallons daily. Ratio of natural gasoline produced to L.P.G. produced is about the same as the ratio found in natural-gasoline plants.

These results and others, presented in the accompanying summary and detailed tables, were obtained from questionnaires sent directly to the operating plants. Response to the inquiries was quite gratifying; return of completed survey forms was practically complete.

For purposes of the survey, field processing plants were defined as those which produce liquid hydrocarbons. Several reports were received in which gas capacities were given but no liquid hydrocarbon production indicated. These plants were omitted from final tabulation, in the interest of standardization.

The survey tables detail the following information, reported separately for the first time: (1) plant gas capacity, (2) gallons of natural gasoline produced per day, and (3) gallons of L.P.G. produced per day.

ARKANSAS

Plant location (field, county, nearest town)—	Gas capacity, M.M.c.f./day	Natural gasoline, gal./day	Total L.P.G. liquids, gal./day
Lion Oil Co.:			
Shuler, Union (El Dorado)	30	20,000	15,000
McKamie Gas Cleaning Co.:			
McKamie - Patton, Lafayette (Magnolia)	52	32,000	43,000
Total	82	52,000	58,000

CALIFORNIA

Ohio Oil Co.:			
South Coles Levee, Kern (Bakersfield)	65	148,200	156,300
Western Gulf Oil Co.:			
Paloma, Kern (Bakersfield)	150	83,000	150,000
Total	215	231,200	306,300

CYCLING PLANTS

State—	No. of plants	M.M.c.f. of gas processed daily	Gallons per day— Natural gasoline produced	Total butane and lighter
Arkansas	2	82	52,000	58,000
California	2	215	231,000	306,300
Louisiana	7	737	1,323,950	341,600
Mississippi	1	100	55,000	37,000
New Mexico	1	8	6,000	17,000
Oklahoma	2	166	238,415	90,700
Pennsylvania	1	(*)	390	None
Texas	22	2,320	1,813,127	1,321,198
Total	38	3,628	3,719,882	2,171,798

*Not reported.

LOUISIANA

Plant location (field, county, nearest town)—	Gas capacity, M.M.c.f./day	Natural gasoline, gal./day	Total L.P.G. liquids, gal./day
The California Co.:			
Lake St. John, Tensas (Ferriday)	100	105,000	75,000
Cotton Valley Operators Committee:			
Cotton Valley, Webster (Cotton Valley)	150	312,550	112,000
Stanolind Oil & Gas Co.:			
South Jennings, Jefferson Davis (Jennings)	55	38,000	8,000
Sunray Oil Corp.:			
Benton, Bossier (Benton)	55	200,000	None
South Sarepta, Bossier (Benton)	12	(*)	
The Texas Co.:			
Bateman Lake, St. Mary (Berwick)	145	135,000	8,000
Erath, Vermilion (Erath)	220	533,400	138,600
Total	737	1,323,950	341,600

*Not processing yet.

Hunter

FLEX-SEAL PLUNGERS

FOR OIL WELL INSERT PUMPS

LONGER LIFE

INCREASES PRODUCTION

NO SAND OR GAS LOCKING

LESS FREQUENT SERVICING

Write for descriptive circular

MANUFACTURED UNDER HUNTER PATENT NO. 2240780, 2475705, BY

W. H. HUNTER ENGINEERING CO.

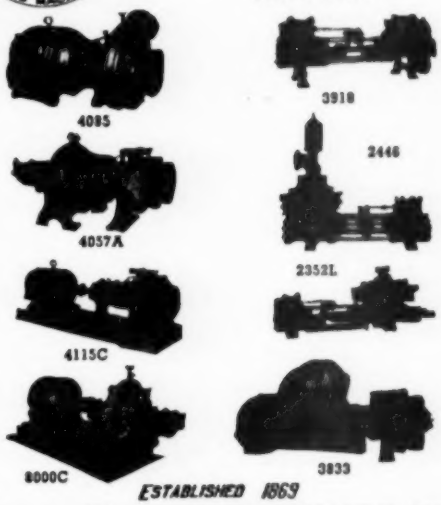
150 Marlborough Drive
Pontiac 19, Mich.

Manufacturer's Representatives Solicited

PUMPS

CENTRIFUGAL
RECIPROCATING

BUILDERS OF OUTSTANDING PUMPS
Since 1869



ESTABLISHED 1869

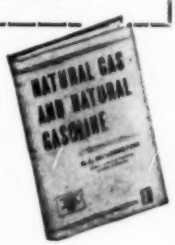
DEAN BROTHERS PUMPS INC.

INDIANAPOLIS IND.

323 W. TENTH ST.

Latest methods in

The production and transportation of natural gas and gasoline



HERE is the up-to-date information you want on the production of natural gas from crude-oil, condensate, and dry-gas fields, and the manufacture of liquefied products from this raw material. This new book discusses the recovery of natural gasoline, as well as its transportation and storage, and the design and operation of gas gathering and natural gas recovery systems.

NATURAL GAS AND NATURAL GASOLINE

By R. L. Huntington
Professor of Chemical Engineering, University of Oklahoma
THE McGRAW-HILL CHEMICAL ENGINEERING SERIES
598 pages, 6x9, $8.00

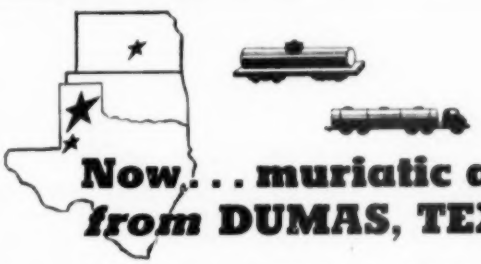
HIS book answers specific questions on the location and design of natural gasoline plants, the estimation of gas and gasoline reserves, and the construction and operation of pipe lines. It takes up recent advances and developments in distillation and fractionation, gas dehydration, absorption, and other operations in the industry.

Check this book for the latest advances in:

- gas condensate cycling
- oil absorption
- fractionation
- gas dehydration
- pipe line design

The case history method is used to illustrate methods and operations, and valuable petroleum data tables bring you information which helps you effect better design and more efficient operation in the various phases of natural gas and gasoline production and transportation.

THE OIL AND GAS JOURNAL
TULSA 1, OKLAHOMA



Now . . . muriatic acid *from* DUMAS, TEXAS

Muriatic acid in tank car or highway tanker lots is now promptly available from a new shipping point – Dumas, Texas. Frontier has contracted for the entire HCl output of the Potash Corporation of America plant there – as an additional service to Frontier customers.

Frontier-owned plants and their products are:

Denver City, Texas – caustic soda, muriatic acid, salt
Wichita, Kansas – caustic soda, muriatic acid, chlorine, benzene hexachloride

Speedy shipment over uncongested routes brings dependable "always-as-specified" Frontier chemicals within overnight reach of many users . . . offers transportation and storage savings. Check with us . . . now!

GEARED TO SERVE THE OIL INDUSTRY

Frontier Chemical Company — Electro Chemical Manufacturers

GENERAL OFFICES
321 WEST DOUGLAS
WICHITA, KANSAS
PHONE 7-5215

Wichita, Kans. • Denver City, Tex. • Midland, Tex. • Denver, Colo. • Dumas, Tex.

JOHN ZINK

JZ

Regardless of the type of Gas to be burned a John Zink Burner will do it!

ACID GAS DISPOSAL

is economical, safe and reliable with Series STF-E Endothermic FIELD FLARE BURNER assemblies —made only by JOHN ZINK.

●

Only John Zink makes the always improving Vertical and Horizontal BI-MIX Burners.

●

The newest burner in a long line of firsts is the Series VPM designed to burn gas of *high* hydrogen content.

The Series VPM is an adaptation of the popular BI-MIX burner. One customer reports

—"very satisfactory

—flame short and crisp without flash-back with primary air door open

—Satisfactorily burns 100% free hydrogen."

●

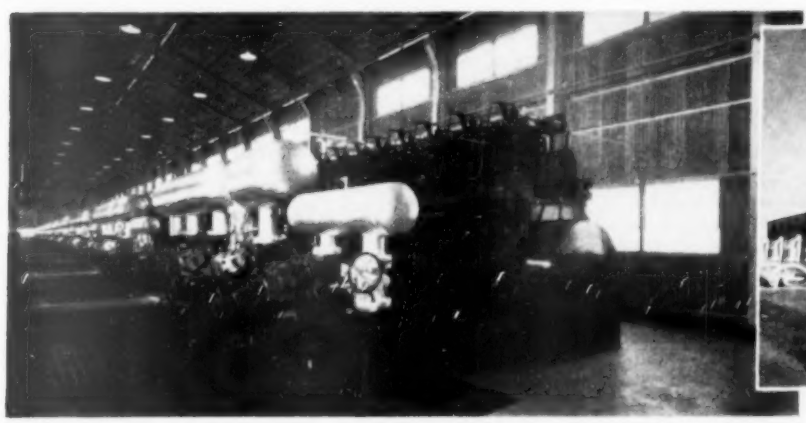
John Zink Burners are protected by more than 25 U.S. Letters of Patent.

JOHN ZINK COMPANY

4401 South Peoria Tulsa, Oklahoma

Plant location (field, county, nearest town)—	Gas capacity, M.M.c.f./day	Natural gasoline, gal./day	Total L.P.G. liquids, gal./day
MISSISSIPPI			
The California Co.:			
Cranfield, Franklin (Natchez)	100	55,000	37,000
NEW MEXICO			
Maljamar Cooperative Repressuring Agreement:			
Maljamar	8	6,000	17,000
OKLAHOMA			
Magnolia Petroleum Co.:			
Chitwood, Grady (Rush Springs)	18	15,715	13,600
Shell Oil Co.:			
Elk City, Beckham (Elk City)	148	222,700	77,100
Total	166	238,415	90,700
PENNSYLVANIA			
H. J. Crawford Estate:			
Pine Grove, Venango (Venus)		390	
TEXAS			
American Liberty Oil Co.:			
Blessing, Matagorda (Blessing)	30	16,800	3,360
American Republics Corp.:			
Hardin, Silsbee	65	80,000	65,000
The Chicago Corp.:			
Stratton-Agua Dulce, Nueces (Bishop) (Wardner plant)	160	71,400	35,112
Stratton-Agua Dulce, Nueces (Bishop) (Gulf Plains plant)	125	62,832	33,096
Stratton-Agua Dulce, Nueces (Agua Dulce) (Coastal plant)	125	37,590	23,814
Francitas Gas Co.:			
Francitas, Jackson (Blessing)	30	20,000	5,000
Gilfring Oil Co.:			
Brayton-Agua Dulce-Riverside, Nueces (Banquete)	60	25,000	7,000
Humble Oil & Refining Co.:			
Katy, Waller (Katy)	555	438,900	518,700
La Gloria Corp.:			
La Gloria, Jim Wells (Falfurrias)	316	207,000	127,500
Lone Star Producing Co.:			
Chapel Hill, Smith (Tyler)	55	48,000	18,000
Magnolia Petroleum Co.:			
Seeligson, Jim Wells (Premont)	206	125,907	111,793
Midland Gasoline Co.:			
Montgomery (Conroe)	40	35,600	39,000
Plomo Co.:			
Brayton, Nueces (Robstown)	60	42,000	22,000
Plymouth Oil Co.:			
Plymouth, San Patricio (Sinton)	65	28,000	20,000
Shell Oil Co.:			
Sheridan, Colorado (Sheridan)	100	85,000	72,000
Stanolind Oil & Gas Co.:			
Burnell-North Pettus, Barnes-Bee-Goliad (Pettus)	166	168,000	119,000
Superior Oil Co.:			
Lake Creek, Montgomery	50	68,018	63,323
Tide Water Associated Oil Co. (Mid-Continent Div.):			
Cayuga, Anderson (Cayuga)	25	14,300	6,700
Long Lake, Anderson (Palestine)	40	11,800	6,200
Trinity Gas Corp.:			
Sejita, Duval	47	30,000	24,600
Wescol Oil & Gas Co.:			
Nordheim, DeWitt		*100,380	
Western Natural Gas Co.:			
San Salvador, Hidalgo		*96,600	
Total	2,320	1,813,127	1,321,198

*Estimated.



BUILT FAST--BUILT TO LAST

METALLIC erection crews are available anywhere.

Whether your needs are large or small, you can save real money and meet your construction deadline by planning your expansion program around STANDARD mass-produced structural steel METALLIC BUILDINGS.

Shop-welded, field bolted METALLIC BUILDINGS are furnished in a wide range of standard sizes up to 130' clear span widths—with optional wall and roof coverings of corrugated asbestos, iron or galbestos.

Standardized yet flexible manufacturing methods permit METALLIC to meet your specifications and personal demands without any sacrifice in METALLIC shop efficiency or appreciable increase in final costs to you.

SO, REMEMBER, THAT IN EFFECT METALLIC GIVES YOU TAILOR-MADE BUILDINGS AT PRE-FAB PRICES.

DESIGNERS • FABRICATORS • ERECTORS OF PREFABRICATED STRUCTURAL STEEL BUILDINGS FOR INDUSTRY

METALLIC BUILDING COMPANY
HOUSTON, TEXAS
4601 HOLMES ROAD • PHONE MI-2466

The Oil and Gas Journal's

Survey of Field Processing-Plant Construction

Showing where new projects are under way or are projected, the companies responsible, current status, the contractor, and the nearest community

Company, location, type of project, status, and contractor—(Nearest town in parentheses)

ATLANTIC REFINING CO.:
Building new plant at Denton field, Lea County, New Mexico (Lovington)—Gas compression facilities now operating. Products will include natural gasoline, butane, propane, mixes, and residue gas—Completion set for April 1954—**Dresser Engineering Co.**

BARNHART HYDROCARBON CORP.:
Adding to compression, dehydration and desulfurization units at present plant at Barnhart field, Reagan County, Texas (Big Lake)—Engineering started. Completion set for July 1954—**Fish Engineering Corp.**

BEL OIL CORP.
Adding L.P.G. facilities to plant at North Elton field, Louisiana (Elton)—Work under way with completion set for May 1954—**Company doing own work.**

CITIES SERVICE OIL CO. (DEL.):
Building new plant in West Seminole field, Gaines County, Texas (Seminole)—Work under way with completion set for October 1954—**Delta Engineering Corp.**

CONTINENTAL OIL CO.:
Expanding plant at Gillis, Calcasieu Parish, Louisiana (Lake Charles), from 26 to 90 M.M.c.f.—Work under way. Completion set for June 1954—**Hudson Engineering Corp.**

EL PASO NATURAL GAS CO.:
Building natural-gasoline plant in Weiner-Floyd field, Reagan County, Texas (Midland)—Completion set for July 1954—**Company doing own work.**

GOLIAD CORP.:
Building natural-gasoline plant in Wilcox Trend field, Lavaca County, Texas (Sheridan)—Work now under way. Completion scheduled for May 1954—**Brown & Root, Inc.**

OTHA H. GRIMES:
New plant to operate in South Lovington field, Lea County, New Mexico (Lovington)—Work now under way. Completion July 1954.

GULF OIL CORP.:
Building new plant to process gas from the Pace and Sueise fields, Runnels County, Texas (Wingate). Planning plant at Krotz Springs, La.—Work scheduled to be finished in April 1954. Tentative completion set for July 1955—**Anderson Baird Co.**

HOMER S. HEAD CO.:
Planning plant at Newcastle, Wyo., to process gas from the Clareton field—Land bought. Completion set for late summer.

ANDREW M. HOWSLEY:
Building plant to process 5 M.M.c.f. of gas from Glen Cove field, Coleman County, Texas—Work started. Completion set for May 1954.

H. L. HUNT-M. B. RUDMAN CO.:
Studying plans for a natural-gasoline plant to supplement Signal Oil Co.'s plant being built near Williston, N. D.

KERR-McGEE OIL INDUSTRIES, INC.:
Expanding present facilities at Pampa, Tex.—Work under way. Completion scheduled for June 1954—**J. E. Carlson, Inc.**

LAKOTA PETROLEUM CORP.:
Planning on building plant in the Hay Creek area of Weston County, Wyoming.

MAGNOLIA PETROLEUM CO.:
Building cycling plant in St. Landry Parish, Louisiana—Construction began February 1954. Completion set for July 1954—**Dresser Engineering Co.**

Company, location, type of project, status, and contractor—(Nearest town in parentheses)

NORTHERN NATURAL GAS CO.:
Building new plant at Hobbs, N. M.—Under construction. Completion set for May 1954—**Dresser Engineering Co.**

OWENS, LIBBY-OWENS GAS DEPARTMENT:
Revamping Charleston, W. Va., plant to produce butane and propane—Work under way. Completion scheduled for July 1954—**Company doing own work.**

PAYNE-JOHNSTON-BYARS:
Will build new plant at Trent, Tex., to process gas from White Flat field of Nolan County—Work to cost approximately $680,000 is up for bids now. September is planned for completion date.

PLOMO CO.:
Adding additional power for casing-head gas at present Robstown, Tex., plant—May 1954 completion date—**Company doing own work.**

REEF FIELDS GASOLINE CORP.:
Adding deisobutanizer and extending compressing facilities of present East Vealmoor, Tex., plant—Work slated to be finished April 1954—**Delta Engineering Corp.**

RENWAR OIL CORP.:
Building additions to present Turkey Creek, Tex., plant—October 1954 completion date—**Company doing own work.**

RICHFIELD OIL CORP.:
Adding to facilities at North Coles Levee, California, plant. Boosting from present capacity of 75 to 100 M.M.c.f.

SHELL OIL CO.:
Increasing capacity at Brea, Calif., plant. Planning to install gas-compression plant at Sterling, Colo.—**J. B. Gill Co.**
Increasing capacity at Elk City, Okla., plant—Completion expected in April 1954—**Fluor Corp.**

SIGNAL OIL & GAS CO.:
Building new gasoline plant at Williston, N. D., to process 65 M.M.c.f. and produce 250,000 gal. of gasoline a day—Completion set for September 1954—**J. F. Pritchard & Co.** (engineering) and **Brown & Root, Inc.** (construction)
Also building plant at Ardmore, Okla., to process 40 M.M.c.f. gas a day and produce 100,000 gal. of gasoline a day—Work under way with completion scheduled for July 1954—**Hudson Engineering Corp.**

SOCONY-VACUUM OIL CO., INC.:
Will build 1½-million-dollar plant at Manderson, Wyo., to process 15 M.M.c.f. of sour gas daily October 1954—**Ralph M. Parsons Co.**

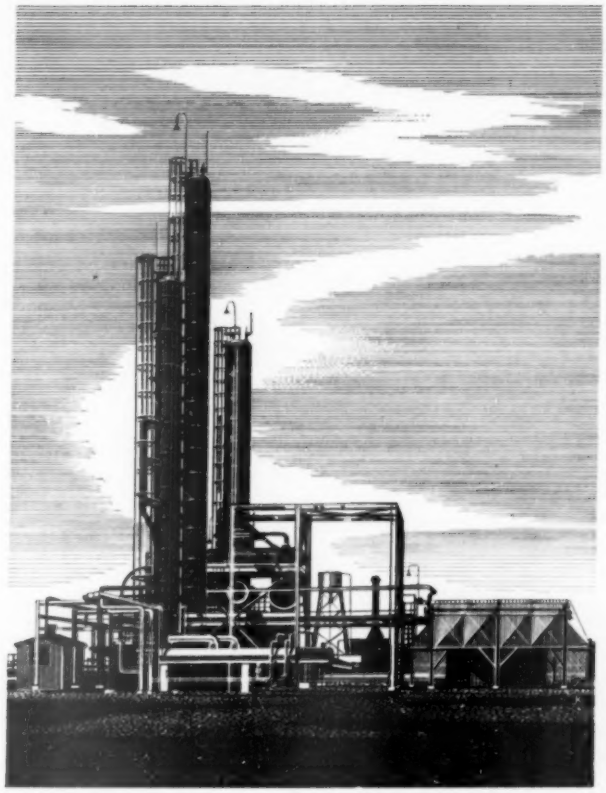
TEXAS PACIFIC COAL & OIL CO.:
Building new plant in Pardue and Toler fields, Fisher County, Texas—Completion set for May 1954—**Fish Engineering Corp.**

TIDE WATER ASSOCIATED OIL CO. (Mid-Continent Div.):
Will build new plant in Venice field, Plaquemines Parish, Louisiana (Venice)—Tentative completion date of December 1954.

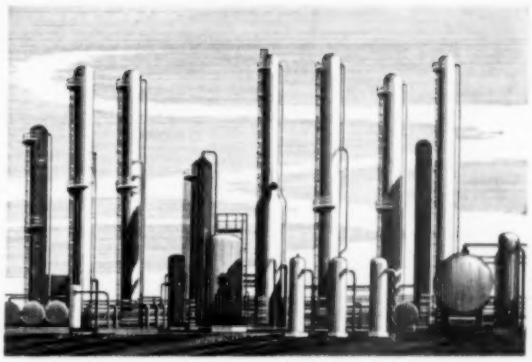
WARREN PETROLEUM CORP.:
Building plant at Lovington, N. M., to process 27 M.M.c.f. of gas daily—Completion scheduled for April 1954—**Fluor Corp.**

THE TEXAS CO.:
Building plant in Honor Rancho field, Los Angeles County, California (Castaic)—Completion scheduled for April 1954—**OFCCO Construction Co.**

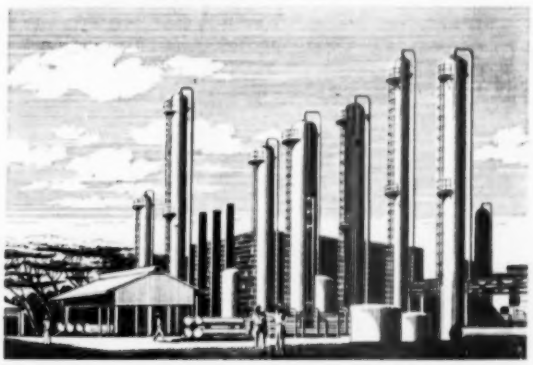
WYOMING GAS PRODUCTS CORP.:
Planning natural-gasoline plant in Weston County, Wyoming—Engineering work under way. No completion date set—**Fish Engineering Co.**



Located near Ballinger, Texas, the above plant (designed, engineered and constructed by Fluor for Runnels Gas Products Corp.) recovers 85,000 gallons daily of LPG and gasoline.



Built by Fluor, this natural gasoline plant for Warren Petroleum near Lovington, New Mexico, processes 22 mmcf/d.



Fluor designed, engineered and constructed this natural gas absorption plant, crude stabilizer and crude topping plant, Colombia, South America, for Colombian Petroleum.

Three more natural gasoline plants by FLUOR

BRINGING THE TOTAL TO 28

Fluor has an impressive record in the design, engineering and construction of natural gasoline plants. Twenty-eight complete units have been built by Fluor, ranging in size from 18 to 185 mmcf/d capacity, with several more under construction. Almost double that number of existing gas plants have been expanded and modernized by Fluor.

Fluor has built virtually every type of field processing plant — gas absorption, pressure maintenance, cycling, gas treating (aqueous, glycolamine, glycol dehydration, desulfurization, diethanolamine, etc.), plus innumerable compressor stations on gas transmission lines. Fluor manufactured products are used extensively throughout the Natural Gas industry. These include cooling towers, Fin-Fan air-cooled heat exchangers, pulsation dampeners, mufflers and gas cleaners for liquid and solids removal.

With headquarters at Los Angeles and a Mid-Continent Division in Houston, Fluor is conveniently located to provide an integrated organization for the design-erection of a complete gas-gasoline plant or any phase of it. Fluor's metal fabricating shops at Paola, Kansas, are well equipped for all types of structural steel and plate work, for the prefabrication of pressure vessels and piping. For more information on Fluor's qualifications in the Natural Gas industry, write for Bulletin FC-RC-0.004.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD.
LOS ANGELES 22, CALIFORNIA

FOREIGN: FACTS FLUOR, PARIS
FLUOR OF CANADA, TORONTO
FLUOR INTERNATIONAL, BEIRUT
FLUOR PERUANA, S.A., LIMA
HEAD WRIGHTSON, LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

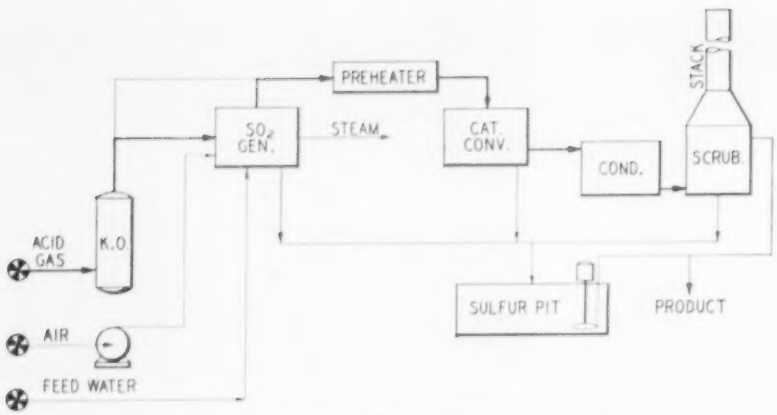


Fig. 1—Typical modified Claus sulfur-recovery flow diagram.

Composition and quantity of feed gas are major factors affecting profitability of

Sulfur Recovery From H_2S

by H. L. Hays and F. T. Barber

COMMERCIALIZATION of sulfur recovery from hydrogen sulfide by-product gases began shortly after C. F. Claus obtained a British patent in 1883 on the well-known vapor-phase catalytic oxidation process. Subsequent improvements and modifications, as well as economic conditions, have made this basic process attractive in this country for the past decade.

Authors are with Phillips Chemical Co., Bartlesville, Okla. Paper presented at N.G.A.A. meeting, Dallas, April 21-23, 1954.

Phillips Petroleum Co. conducted research studies and semiplant operations on this process as early as the late 20's, but it was not until 1951 that conditions made sulfur recovery economically attractive to us. The major factors contributing to the attractiveness were the increase in price to $21 per long ton (now $26.50 per long ton), accelerated tax writeoff, dwindling sulfur reserves, and our expansion program requiring additional sulfur for raw material. Phillips began the construction of two plants early in 1951 which have a combined design capacity of 150 long tons per stream day.

These plants actually represent Phillips' third venture into sulfur recovery from hydrogen sulfide. The first venture was at Crane during 1929 and 1930 following pilot-plant studies in an attempt to produce and market colloidal sulfur. Sulfur was produced by burning acid gas, cooling and recovering SO_2 at the same time with water, then reacting the recovered SO_2 with additional H_2S to form elemental sulfur. This process was uneconomical at that time.

In Phillips' second venture, this time located at Judkins, SO_2 was generated by burning sulfur, then reacted with H_2S still in the hydrocarbon stream. This project was suspended about 1935.

Modified Claus Process

The design of our present plants is somewhat similar to the original Crane process. The flow diagram, Fig. 1, is typical of Phillips' installations. Sulfur dioxide is generated by utilizing compressed air to oxidize a portion of the H_2S in a pressurized combustion zone designed in such a manner that the generator gas temperature may be limited by producing steam from feed water. At least 40 per cent of the available H_2S is passed through the SO_2 generator even though oxygen is supplied only in quantities sufficient to satisfy the following equation for the total quantity of H_2S available:

$$H_2S + \tfrac{1}{2}\,O_2 \rightarrow H_2O + S$$

Generator effluent gases are mixed with gas bypassing the generator to

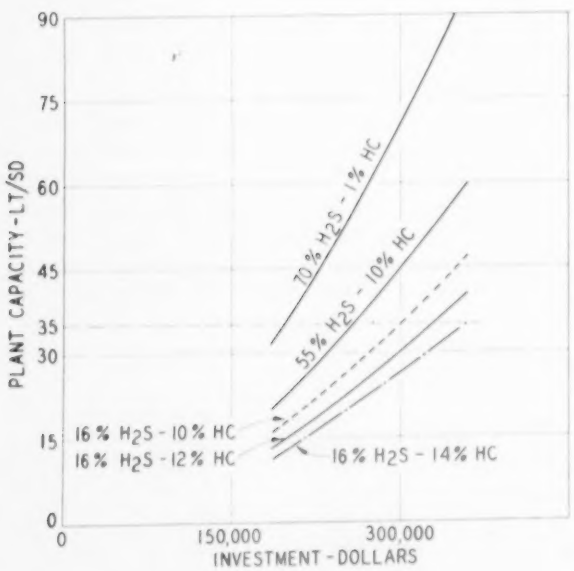


Fig. 2—Plant capacity vs. investment.

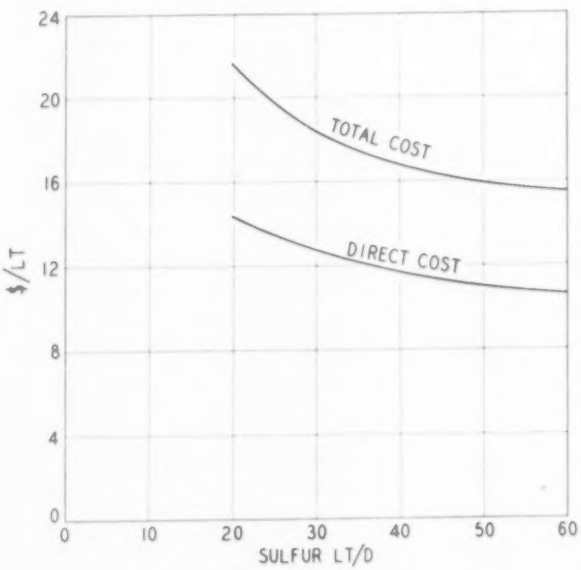
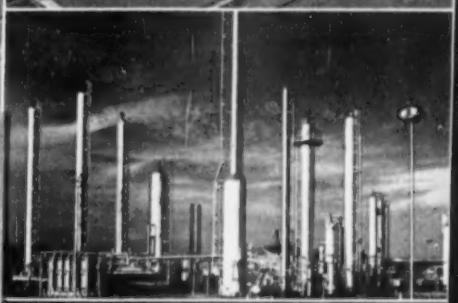
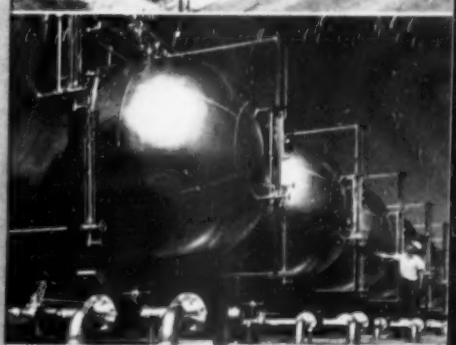
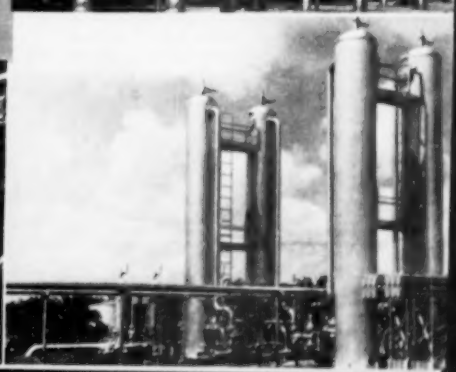


Fig. 3—Production cost vs. capacity.







1945

Mid-Co.
Malakoff, Texas

1946

Southern Minerals
Agua Dulce, Texas

Hunter & Hunter
Novice, Texas

T G T
Jefferson, Texas

1947

Warren
Fairbanks, Texas

T G T
San Salvador, Texas

Pan American
Kountze, Texas

Gray Wolfe
Pinehurst, Texas

1948

Warren
Fairbanks, Texas

Lion
Shuler, Arkansas

Wehlu
Edmond, Oklahoma

Warren
Mobile, Alabama

Gulf
Kiefer, Oklahoma

Barnsdall
McFaddin, Texas

1949

Texas Co.
Archer City, Texas

Lion
Shuler, Arkansas

Barnsdall & Sterling
Bloomington, Texas

Baldridge & King
San Pablo, Texas

Barnsdall
Placedo, Texas

Reno Oil Co.
Geraldine, Texas

1950

Del Rey
Chesterville, Texas

Humble
South Mayes, Texas

General Crude
Dayton, Texas

Mid-Valley
Clarkson, Ky.

Pecos
Orla, Texas

1951

Pan American
Willamar, Texas

T G T
East Bernard, Texas

Del Rey
Chesterville, Texas

General Crude
Dayton, Texas

Texas Co.
Snyder, Texas

Sunray
Placedo, Texas

1952

Mid-Valley
Clarkson, Ky.

El Paso Natural
Orla, Texas

Shell
Gohlke, Texas

Texas Co.
Snyder, Texas

General Crude
Clairemont, Texas

T G T
East Bernard, Texas

T G T
Victoria, Texas

Del Rey
Chesterville, Texas

Humble
South Mayes, Texas

1953

Sarroc
Gas and Water Injection
Snyder, Texas

Humble
Trowick, Texas

Tennessee Production
Chesterville, Texas

Texas Co.
Paradis, Louisiana

Tennessee Production
Banquete, Texas

Warren
Fairbanks, Texas

El Paso Natural
Orla, Texas

1954

Sunray
Ingleside, Texas

Texas Co.
Paradis, Louisiana

Warren
Conroe, Texas

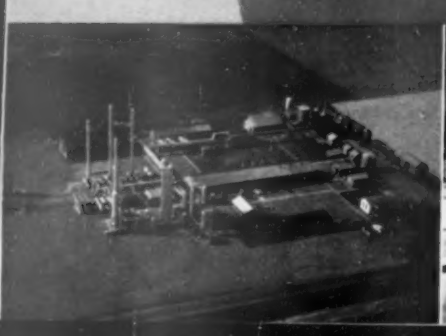
Sun
Sweetwater, Texas

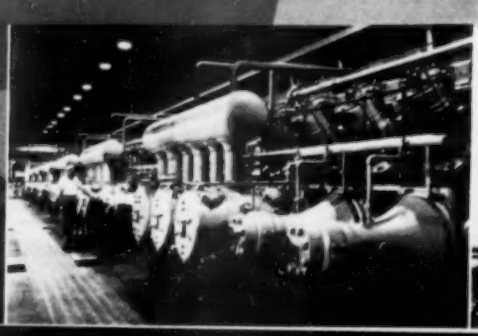
General Crude
Clairemont, Texas

NATURAL GAS
PROCESSING PLANTS

O. L. OLSEN COMPANY

ENGINEERS & CONSTRUCTORS
416 PIERCE AT BRAZOS
HOUSTON 3, TEXAS





first really new development in safety spectacles in years!

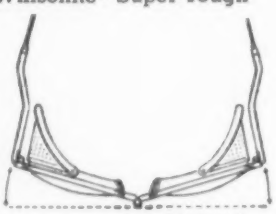
WILLSON
*"Contour-Spec"**

Style WCS47
Covered by Design Patent 168,988

New... hinged bridge gives snug, comfortable fit... self-adjusting to *any* facial contour!

1. **New hinged bridge** combines the flexibility of cup-type goggles with the lightweight, compact protection of safety spectacles.
2. **One all-purpose size** permits universal fit. Bridge hinge gives automatic adjustment to any bridge width from 18-26 mm.; one eye size—47 mm.—fits everybody. *No need to stock a variety of bridge and eye sizes.*
3. **Plastic nose-and-cheek pads** provide *full closure* around eye cavity.
4. **Contour-shaped** adjustable plastic-and-cable temples hold spectacles firmly in place.
5. **Matching sideshields** are perforated plastic, providing protection at sides—*fold back* for pocket compactness.
6. **Butyrate frame**—*toughest plastic used for spectacles.* Standard frame is flesh colored, fitted with 6-curve Willson Super-Tough® glass lenses. Available also with green frame and sideshields, fitted with Willsonite® Super-Tough green glass lenses.

Hinged to fit any face snugly!
See how the unique hinged bridge allows the Contour-Spec to open up to fit broad faces and close up for narrow faces. It's this feature that allows Contour-Specs to contact the entire eye cavity and makes them fit so comfortably yet securely.



*Trademark

Order a supply of Contour-Specs from your Willson distributor. Let your workers try their amazingly greater comfort, and see how they're preferred over ordinary safety spectacles!

More Than 300 Safety Products Carry This Famous Trademark
WILLSON
Established 1870

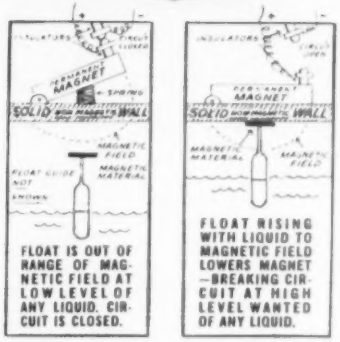
WILLSON PRODUCTS, INC., 204 Washington St., Reading, Pennsylvania

Invisible **MAGNET**
power through stainless steel wall controls liquid level you want without fail—ever.

NEW
LEVEL-MASTER
for all liquid level control is SAFE and SURE

- No leaky connections
- No complex construction
- No maintenance
- No explosion hazard

MAGNETIC PRINCIPLE works *"Naturally"* like this


PERMANENT MAGNET
SOLID NON-MAGNETIC WALL
MAGNETIC FIELD
MAGNETIC MATERIAL
FLOAT GUIDE NOT SHOWN
FLOAT IS OUT OF RANGE OF MAGNETIC FIELD AT LOW LEVEL OF ANY LIQUID. CIRCUIT IS CLOSED.
FLOAT RISING WITH LIQUID TO MAGNETIC FIELD LOWERS MAGNET—BREAKING CIRCUIT AT HIGH LEVEL WANTED OF ANY LIQUID.

Switch action can be reversed for low and high level control and used also for single pole double throw switch.

Use the coupon now for complete information. There is a LEVEL-MASTER for every application—for every liquid. The LEVEL-MASTER is compact and can be mounted on the side—on the top—or externally. Can be used on both closed and open tanks. Operates at all liquid temperatures, pressures and gravities.

And—prices start at only $37.50. Write today for illustrated literature and price list.

Sales franchises available for some territories—write

Jo-Bell Products, Inc.
4842 So. St. Louis Ave.
Chicago 32, Illinois
Please send me LEVEL-MASTER literature and price list.
Name_____
Company_____
Address_____
City_____

form the reactant stream. Reactant temperature is adjusted in the preheater prior to the catalytic conversion chamber. Sulfur vapor is formed in this chamber; however, in some instances the dew point is reached and a portion of the vapor is condensed. Sulfur-laden gases from the conversion chamber pass through a condenser where they are cooled and the sulfur condensed. Waste gases leaving the condenser pass through a scrubber or coalescer to break down any sulfur fog or mist and retrieve entrained sulfur liquid before being discharged through the stack.

The sulfur product is collected in a reinforced concrete pit containing steam coils for insurance against solidification. All equipment is provided with lines for draining sulfur through a seal leg to this pit. The pit drains to a pump well which accommodates the submerged, centrifugal pumps used for removing the sulfur.

Process variations . . . The foregoing is a condensed process description of the present-day Claus process. The simple objective of replacing the sulfur in H_2S with oxygen by introducing only stiochiometric quantities of oxygen to the system is so flexible that numerous modifications, each meritorious in some respect, have been developed. The type of equipment, degree of instrumentation, method of SO_2 generation, type of heat exchange and sulfur condensing system, number of catalytic conversion stages as well as incremental reaction steps are some of the flexible points. Actually, the specific process details become minor when we consider some of the other aspects which may affect the decision to install a sulfur-recovery plant.

Major Factors

The composition of the feed gas, along with the quantity available, is the major factor influencing the profitability of a sulfur recovery plant. Other influencing factors are:

1. Proximity of feed stock and market.
2. Availability of utilities.
3. Availability of supervisory, maintenance, and operational personnel on a part-time basis.
4. Availability of transportation facilities.

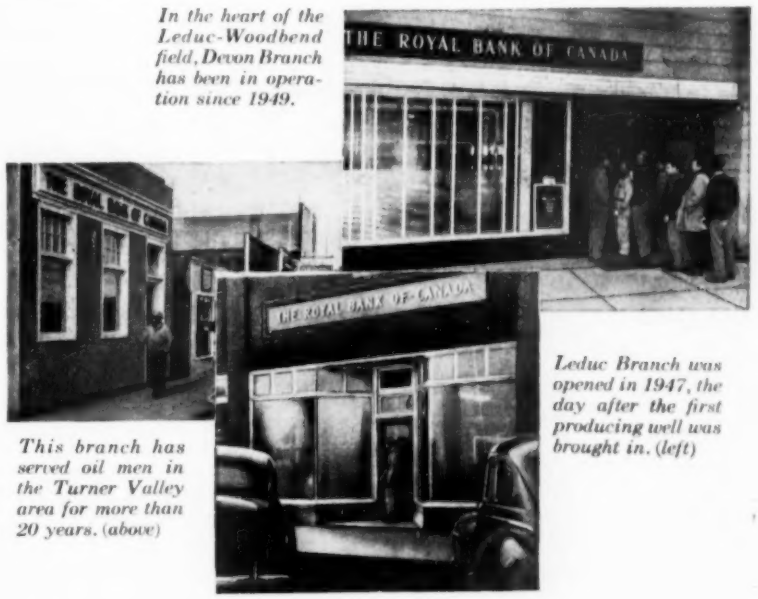
Limited time allows only for the discussion of how the composition and, to a lesser degree, the quantity of feed gas affects the cost of sulfur recovery.

Effect of composition . . . To illustrate the variations in investment with feedstock composition at various capacity levels, we have prepared the accompanying graphical analysis. For the purpose of comparison, let us assume a plant capacity of 35 long tons per stream day. With a gas of high hydrogen sulfide content (70 per cent H_2S) and a hydrocarbon content of 1 per cent, the battery limits investment will be approximately $195,000. For a gas of medium hydrogen sulfide content (55 per cent H_2S) and hydrocarbon content of 10 per cent, the battery limits investment will be approximately $260,000. For a low hydrogen sulfide gas (16 per cent H_2S) with a hydrocarbon content of 12 per cent, the battery limits investment will be about $330,000.

In order to further illustrate the effect of hydrocarbons in the feed-stock stream on plant investment, we have assumed that the hydrocarbon content of the low quality gas is increased from 12 to 14 per cent. This has the effect of increasing the battery limits investment by approximately $30,000. Conversely, a decrease in hydrocarbon content from 12 to 10 per cent will decrease the investment by about $30,000.

Effect of quantity . . . In order to show the effect of the quantity of sulfur

In the heart of the Leduc-Woodbend field, Devon Branch has been in operation since 1949.



Leduc Branch was opened in 1947, the day after the first producing well was brought in. (left)

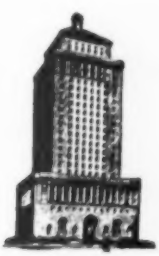
This branch has served oil men in the Turner Valley area for more than 20 years. (above)

Through branches like these...

Through more than 260 other branches in the Western "oil" provinces of Manitoba, Saskatchewan, Alberta and British Columbia, Canada's "Oil Bank" offers exceptional services geared to the special needs of the industry.

At Calgary, Alberta, financial center of the industry, an Oil and Gas Department facilitates and coordinates the banking services required by oil and gas men. For a free booklet describing our unique *Special Bulletin Service*, with bulletin titles and other useful information, write to: Oil and Gas Dept., 102 Eighth Avenue, Calgary, Alberta.

CANADA'S OIL BANK SERVES THE INDUSTRY



THE ROYAL BANK OF CANADA

Canada's Oil Bank

Total assets exceed $2,800,000,000

available upon the economic outlook, we have compared the manufacturing costs with plant capacity in the accompanying graph. The analysis is for a medium hydrogen sulfide content stream (55 per cent H_2S) with a hydrocarbon content of 10 per cent. If there is enough sulfur available in the acid-gas stream to provide production amounting to 60 long tons of sulfur per stream day, the direct costs will be about $10.80 per long ton depending on proximity of loading facilities and other factors. The indirect costs will be in the order of $4.70 per long ton for a total cost of $15.50 per long ton. If the available sulfur amounts to only 20 long tons per day, the direct costs will be approximately $14.40 long tons, the indirect costs will be $7.20 per long ton, and the total cost will be about $21.60 per long ton.

Operating Problems

Operating problems may be cataloged under several headings; however, all significant difficulties fall within the classification of gas supply, control, acid-gas combustion, corrosion, and handling of sulfur.

1. Gas supply . . . Since a sulfur plant depends on a gas treater for feed stock and there is no direct control over feed-stock supply, provisions must be made to vary the operation of the sulfur plant as the gas treater operation varies. Furthermore, upsets in the treaters may result in carryover of amines and hydrocarbons which can present serious troubles particularly from the standpoint of catalyst fouling.

2. Control . . . For efficient operation, it is essential that the H_2S-SO_2 ratio be controlled at 2.0. With a variable quantity and composition of acid gas this becomes a difficult control problem since there are no rapid and simple test procedures for accurately determining this ratio. Furthermore, the air supply must be carefully controlled to achieve optimum and trouble-free operation. Caution must be exercised in preheating the catalyst bed or burning off depositions, not allowing catalyst temperatures to become excessive otherwise serious reduction in catalyst activity and off-color product may result.

3. Combustion of H_2S . . . Even though H_2S has excellent combustion characteristics, various factors may result in burning difficulties. The inadvisability of premixing acid gas and air at the pressure and temperatures usually existing necessitates supplying oxygen requirements as secondary air. The 100 per cent secondary air, low-pressure gas supply, relatively large throughput, oxygen deficiency combustion, and a diluted gas supply tend to produce an elongated flame and incomplete oxygen consumption. Consequently, provisions must be made to overcome these undesirable obstacles. Hydrocarbon contents in excess of 5 per cent result in high flame temperatures which may cause refractory damage unless handled properly.

4. Corrosion . . . The composition of the feed stock at one of our plants presented the possibility of operating at times near or below the dew point of mixtures of H_2S, SO_2, CO_2, and water vapor in lines designed to operate at relatively high temperatures. Therefore, these carbon-steel lines were provided with an internal corrosion-resistant lining. Feed-stock composition for our other plant is such that corrosive conditions were not anticipated, consequently, unprotected carbon-steel lines were installed throughout. To date no corrosion failures have been encountered in either plant.

We have found, however, that carbon steel will corrode rapidly when exposed to mixtures of H_2S, SO_2, sulfur, and water vapor at about 750° F. This corrosion attack occurred on the hot end of the condenser tubes exposed to the converter effluent gases. In gen-

PROVED FOR SMALL LEASES

Improve your extraction of liquids from gas wells on the lease by installing a MICRO gasoline extraction plant. These small plants, which also dehydrate the gas, are easy to install and operate. Since they are fully automatic, continuous attendance is not required.

Contact Russell Engineering for full information on how a MICRO gasoline plant can help you make the most from your natural gas production.

RUSSELL ENGINEERING
COMPANY
2609 SUNSET BLVD. • HOUSTON, TEXAS

HUDSON Solo-aire UNITS

FOR OIL REFINERY PROCESS COOLING

In this modern South Texas Refinery 80% of the unrecovered heat from the topping unit is dissipated directly to the air thru Hudson Solo-aire exchangers. The use of Solo-aire units for air-cooling all streams leaving the topping unit, including residuum at about 600° F, obviates the circulation of about 7000 gallons per minute of cooling water, and eliminates maintenance expense due to scale deposition and corrosion usually encountered in water cooling of high temperature streams.

Units pictured below are used for condensing and cooling

GASOLINE

NAPHTHA

KEROSENE

BURNING OIL

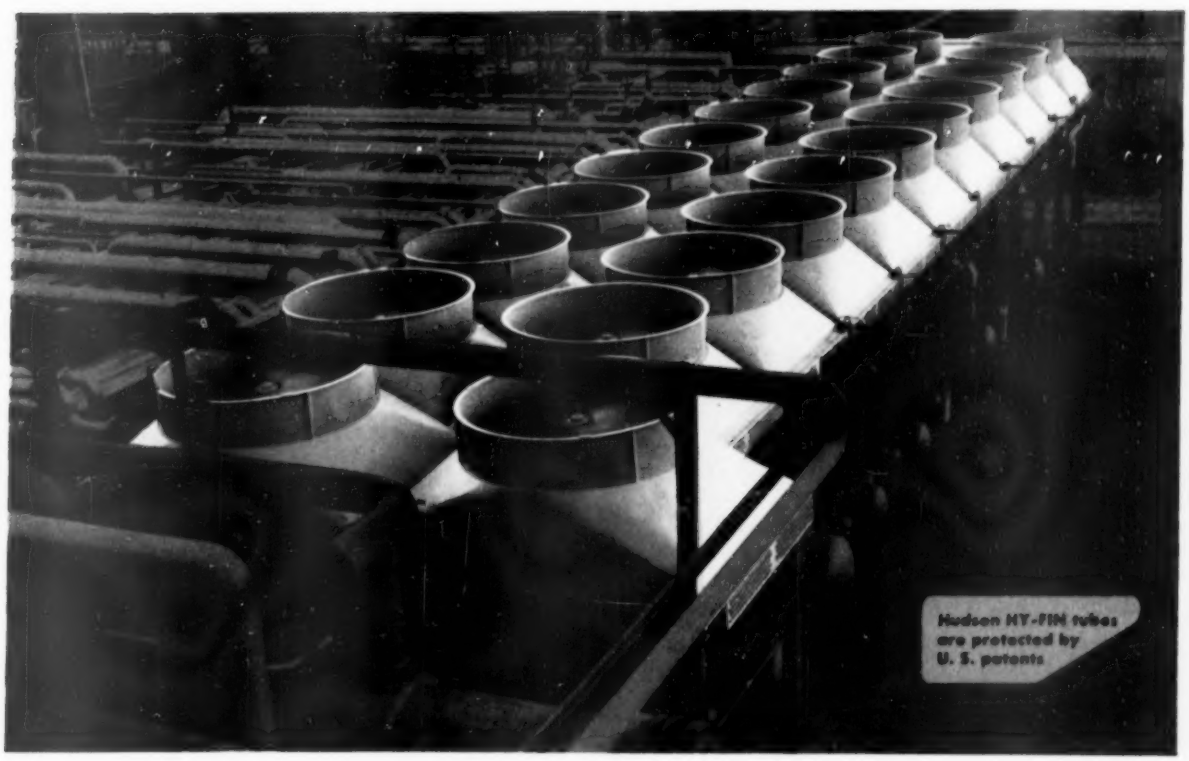
GAS OIL

RESIDUUM

Hudson Solo-aire units, equipped with HUDSON HY-FIN bi-metal tubes are designed for refinery services, incorporating features to assure uninterrupted performance with low operating and maintenance costs.

HUDSON
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS



HUDSON

Top Performance

COOLING EQUIPMENT

For more than two decades HUDSON personnel have developed equipment for heat recovery and heat dissipation. Present day HUDSON cooling equipment has been evolved through the years by constant improvements in design and fabrication.

COOLING TOWERS

COOLING TOWERS

Beauty and utility have been successfully combined in the HUDSON "TP" design. These Top Performance cooling towers embodying new but proven advancements in water cooling design, result in lower installation and operating costs for a given guaranteed performance.

SOLO-AIRE EXCHANGERS

SOLO-AIRE EXCHANGERS

HUDSON Solo-aire exchangers for jacket water cooling, gas cooling, steam condensing and hydrocarbon vapor condensing have found wide use, particularly where suitable cooling water is impossible or expensive to obtain. Even where adequate quality and quantity of water is available there are conditions under which these units have marked advantages over alternative cooling methods. Designs are available for pressures up to 5,000 pounds per square inch.

COMBIN-AIRE UNITS

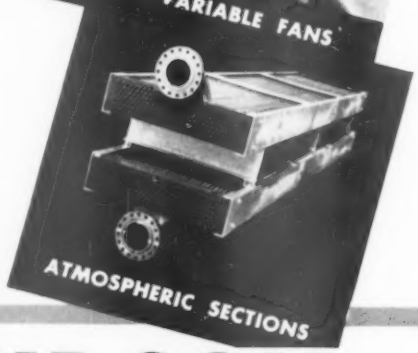
COMBIN-AIRE UNITS

By combining in one structure Solo-aire units with a cooling tower, HUDSON originated the Combin-aire unit. In hot weather, air before use in the Solo-aire units, is contacted with water to reduce both air and water temperature. In cold weather, water use is unnecessary. This device makes possible the use of air for low temperature cooling, allows use of untreated water, minimizes water consumption, and results in capital and operating savings.

AUTO-VARIABLE FANS

AUTO-VARIABLE PITCH FANS

The latest in a long list of Hudson innovations. The auto-variable pitch fan controls cooler outlet temperature through automatic change in fan blade pitch, which in turn changes air volume across cooler tubes. Outlet temperature is closely controlled, and in a typical case horsepower consumption over the year is reduced seventy percent as compared with fixed pitch fan operation.



ATMOSPHERIC SECTIONS

ATMOSPHERIC SECTIONS

These units are for use where water serves as cooling medium. They may be mounted vertically or horizontally, under cooling tower or submerged in water.

UNDIVIDED RESPONSIBILITY—***Complete integration of facilities in selection, design and manufacture of cooling towers, water cooled atmospheric sections, and air cooled exchangers results in cooling systems of minimum first cost, minimum operating cost, and in undivided responsibility.***

HUDSON

ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

eral, we have concluded that corrosion is not severe and that carbon steel is a satisfactory construction material for sulfur plants provided water dew points are exceeded and temperatures are held below 750° F.

5. Sulfur handling . . . Sulfur is produced in liquid form and may be handled as such or solidified and handled as a solid. Unique viscosity characteristics coupled with a melting point near 250° F. limit the temperature range for satisfactory handling between 250° and 320° F. Below this range, sulfur solidifies while above the range, sulfur becomes very viscous and difficult to handle. All equipment, including sumps, transport tank trucks, and tank cars, must be carefully steam jacketed or provided with steam coils. Steam tracing has proved unsatisfactory. We have experienced no serious handling or transportation problems when proper precautions were taken to maintain the molten sulfur within the above temperature range.

In summary, the modified Claus sulfur-recovery process is based on simple straightforward principles; however, close control must be maintained to insure optimum and trouble-free operation. The decision to install a sulfur plant must be based on a close examination of the merits of the particular case under study rather than the general economic condition of the industry.

BOOKS

GRAPHIC PROBLEMS IN PETROLEUM GEOLOGY. By L. W. Long and Julian W. Low. Published by Harper & Brothers, 49 East Thirty-third Street, New York 16. 238 pp. $4.50.

This book is a practical laboratory manual for the training of students in petroleum geology and junior geologists in oil companies. It is well organized and is a worthwhile text book. The volume consists of 31 practical problems, covering the fields of stratigraphy, structure, and oil-field development. The methods presented are drawn from the experience and practices of operating oil companies. The manual includes background and text material and explores the broader aspects of petroleum geology. At the end of each exercise there are questions which review the problem and related subjects.

CONDENSATE WELL CORROSION. By the N.G.A.A. Condensate Well Corrosion Committee. Published by the Natural Gasoline Association of America, 422 Kennedy Building, Tulsa. 203 pp. $6. In lots of 10 or more, $5.50.

Here is a summary of 10 years of cooperative research and field studies by a committee composed of metallurgists, chemists, and engineers of 31 oil companies. For the first time in book form there is presented the current knowledge of the mechanism of anaerobic acid corrosion as well as the behavior of steel and alloys in such systems. The book contains fundamental data useful in the study of corrosion in all petroleum production systems. It will be highly valuable to operators in areas where corrosion due to carbon dioxide, dilute organic acids, or other weak acids is encountered.

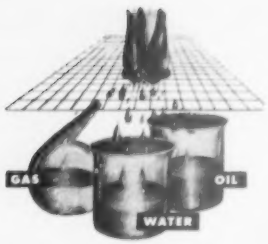
ENERGY TRANSFER IN HOT GASES. Proceedings of symposium held September 17 and 18, 1951, National Bureau of Standards Circular 523. 126 pp. $1.50. (Order from Government Printing Office, Washington 25, D.C.).

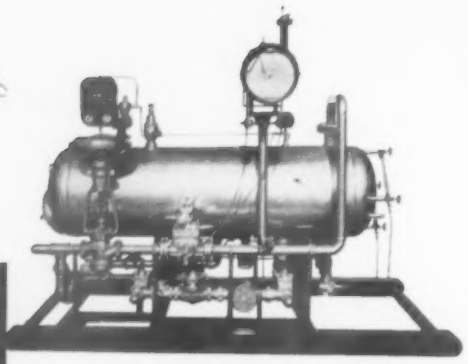
The problems of radiation from flames and hot gases, and basic chemical and physical mechanisms governing energy transfer in those media, are subjects of current interest in which several divisions of NBS have been active. These problems have both theoretical and practical importance in a number of fields. The improvement of heating devices of all kinds, of jet motors, gas turbines, and internal-combustion engines, depends upon a fuller understanding of the detailed mechanisms of energy transfer and the combustion process. Many of the same problems arise in widely diverse areas; for example, in high-speed aerodynamics and in the effects of solar radiation on the upper atmosphere. Sixteen papers are included in the volume. They were presented by outstanding scientists from throughout the world and cover much research not reported before.

CHROMOTOGRAPHIC FRACTIONATION OF CRUDE PETROLEUM OILS. By Clarence Karr, Jr., W. D. Weatherford, Jr., and R. G. Capell. Published by Mellon Institute, 4400 Fifth Avenue, Pittsburgh 13. Gratis.

This is a reprint from Analytical Chemistry published by American Chemical Society.

This is the way to
get things clean...FAST...
at minimum labor cost
KELITE
FORMULA 89
Contains amazing Kelite NU-RE-SOL*... Safe on Painted Surfaces...Built-in Scale Inhibitor...No odor, safe on skin and clothing... Exceptional "wetting-out" qualities.
*an exclusive Kelite development
Here is the world's best combination for defeating dirt. A Kelite Steam Cleaner Plus Kelite Formula 89 will safely clean a white sidewall tire ...an earthmover...an oil well...a truck body...a diesel engine...a canning machine. In mere minutes, and without previous experience, you — or anyone — can clean away heavy accumulations of muck or tenacious deposits. Why not see how easy and effective it is to clean the Kelite Way.
"Click the switch" and start steam cleaning.
No skill needed. If water supply fails, burner and pump shut off automatically.
Rugged! No flimsy diaphragm here. Heavy duty piston pump with stainless steel ball check valves gives service you can bank on.
Just send for free illustrated Bulletin No. 128 today. Kelite Products, Inc. Home Office, 1250 North Main Street, Los Angeles 12, California
KELITE
Offices in 98 Principal Cities and 16 Countries Abroad
PLANTS IN LOS ANGELES — BERKELEY HEIGHTS, N. J. CHICAGO — DALLAS — MEXICO CITY





MOST ACCURATE METERING WITH EXCLUSIVE DEGASSING ELEMENT

TEST SEPARATORS

Well fluid is separated into the three phases of oil, gas, and water. Any one or all three of these phases may be metered. The degassing and defoaming element assures maximum oil metering accuracy by completely separating oil and gas and by breaking up foam. *Oil Metering* Test Separators are available in any size and working pressure required. Write for bulletin WT-952.

The Industry's Standard for Field Metering and Processing Equipment

OIL METERING and Processing EQUIPMENT CORP.

OIL METERING AND PROCESSING EQUIPMENT CORPORATION

4843 YALE STREET • HOUSTON 18, TEXAS • MElrose 1226

Export Office: Val R. Wittich, 30 Rockefeller Plaza, New York 20, N. Y.

OASIS *EXPLOSION-PROOF* WATER COOLER

Now available for isolated locations where hazardous, explosion areas exist and water facilities are not available — Electric water cooler bottle type

features

The Oasis Explosion Proof Water Cooler, Model OB-2-SX, offers these outstanding features:

- Serves 35 people
- Three quart capacity
- 5 year warranty
- No plumbing connections
- Height, 42" (less bottle; width, 15¼"; Depth, 13½".
- Requires 115 volts, 50-60 cycle, single phase, alternating current

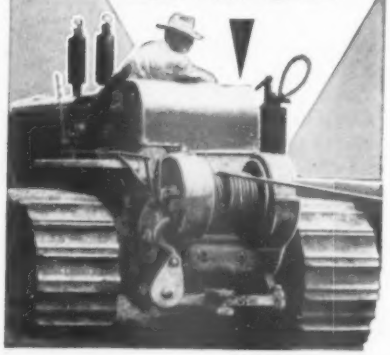
Phone: 5-1241.

When it's Electrical

NELSON ELECTRIC SUPPLY CO.

526 North Main • TULSA

THIS CARCO WINCH



HAS A GEAR TRAIN BUILT FOR LONG, SUSTAINED PULLS

THE GEAR TRAIN of the Carco GO winch is engineered for the long, sustained pulls found in oil field and pipeline work. As a result, you can pull with a Carco GO winch for indefinite periods without the gear train producing excess heat. This is only one of the reasons why Carco GO winches are giving such outstanding performances for pipeliners and oil field operators. Another and even more vital reason is that the Carco GO winch was specifically designed for oil field and pipeline work. That's why it's built with large drum capacity, automatic brake and two speeds forward and two reverse. One slow speed for the long, sustained pulls and another for lighter winching jobs. Roller type fairlead is easily attached. See your nearest Carco dealer. PACIFIC CAR AND FOUNDRY COMPANY, Renton, Washington. Branches at Portland, Oregon, and Franklin Park, Illinois.

WINCHES For All Industrial Tractors

CARCO

How Tide Water combated problems met in

High-Pressure-Gas Production in Louisiana

Corrosion and high wax content challenged operators

by T. Ed Griffith and C. O. Miller

DEEPER drilling and resulting higher-pressure gas discoveries are bringing additional development and production problems. These problems resolve themselves into the following categories—high pressure, corrosion, high-wax content, and reversal of the Joule-Thomson effect.

This article outlines the problems encountered by Tide Water Associated Oil Co. in connection with the development and production of the Southdown sand, Hollywood field, Louisiana. Shut-in tubing pressure of one well is more than 9,500 psi.; but there is no hydrate problem because the gas heats as it expands. However, wax content of the fluid has necessitated use of standby separators, and corrosion pitting has measured as much as 1/32 in. deep in a 5-month period.

There have been several abnormally high-pressure gas zones discovered recently: General Crude Oil Co. successfully completed its 1 Mitchell in the Raywood area, Liberty County, Texas, through casing perforations 11,391-11,456 ft. with a shut-in surface tubing pressure of 9,600 psi.

Another high-pressure discovery was made by Sun Oil Co. in its 23 Belle Isle Corp. well, St. Mary Parish, Louisiana, which on drill-stem test of a zone at 12,500 ft. had 4,000 psi. surface pressure in 90 seconds. This well went to salt water before it was cleaned up. Shut-in surface pressure of the salt water column was 7,000 psi., which gave a calculated bottom-hole pressure of 12,800 psi. It was calculated that this well would have had a surface pressure of approximately 10,500 psi. had it not gone to salt water.

Authors are with Tide Water Associated Oil Co., Houston. Paper presented at N.G.A.A. meeting, Dallas, April 21, 1954.

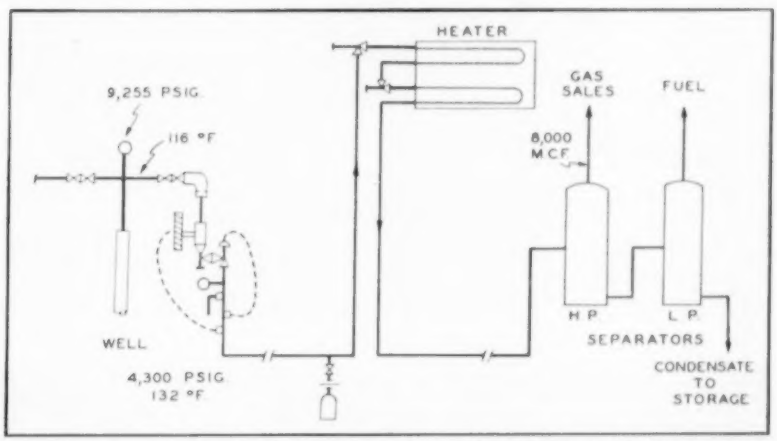


Fig. 1—Surface production facilities at Tide Water Associated Oil Co. 2 Southdown Sugars.

Tide Water Associated Oil Co. discovered the Southdown reservoir, which had a calculated bottom-hole pressure of 11,800 psi. in Hollywood field during 1953. On March 22, 1953, while Tide Water was drilling the 1 Southdown Sugars well, Terrebonne Parish, Louisiana, at 14,350 ft. with 7-in. casing set at 12,639 ft. using 12.6-lb. mud, it was noted that the well began to kick.

It was previously determined that open-hole formation from 12,639 ft. to total depth took drilling fluid when attempts were made to weight mud over 12.6 lb. per gallon. A ring gasket installed between the bradenhead and first blowout preventer failed when the blowout preventer was closed, causing the well to blow out.

Out of control . . . The well blew wild

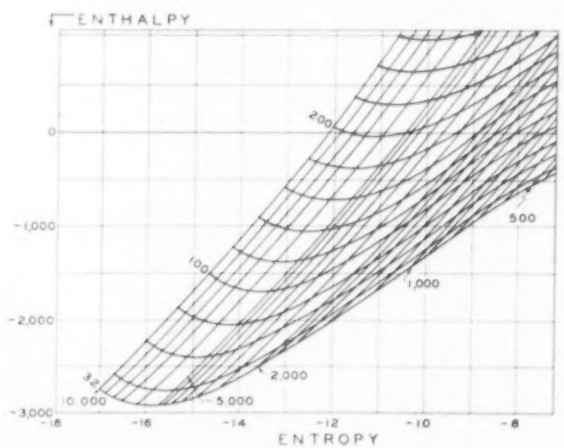


Fig. 2—Brown enthalpy-entropy diagram for 0.8-gravity natural gas.

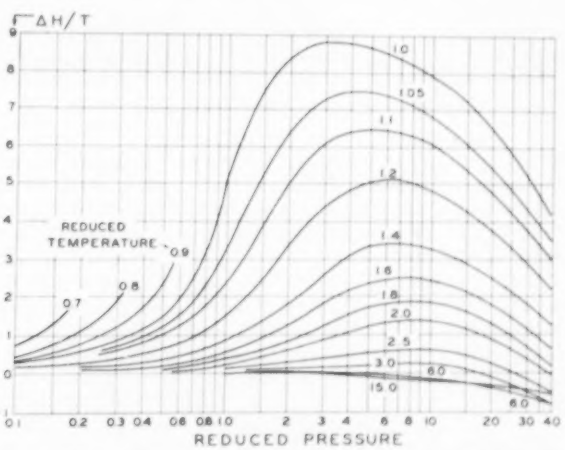


Fig. 3—Generalized enthalpy-difference chart (Watson and Smith).

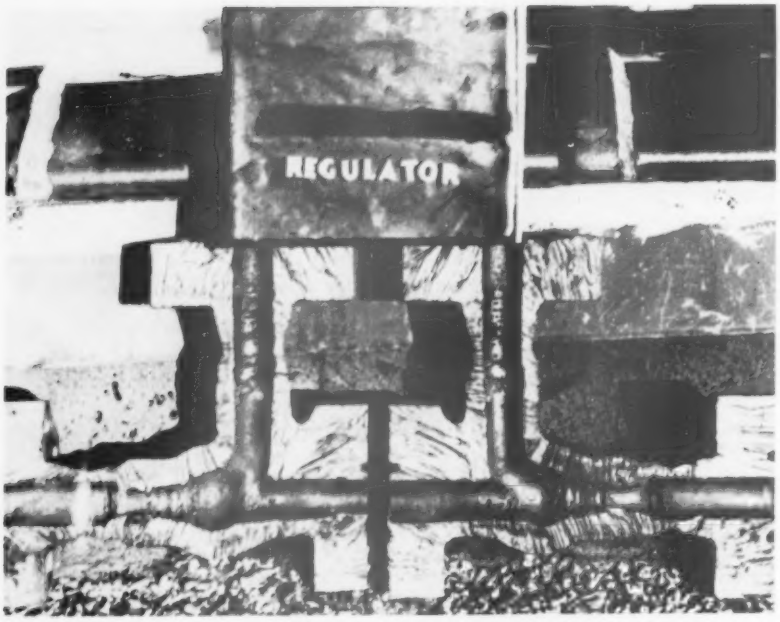


Fig. 4—Pressure-reducing regulator removed from 2 Southdown Sugars well.

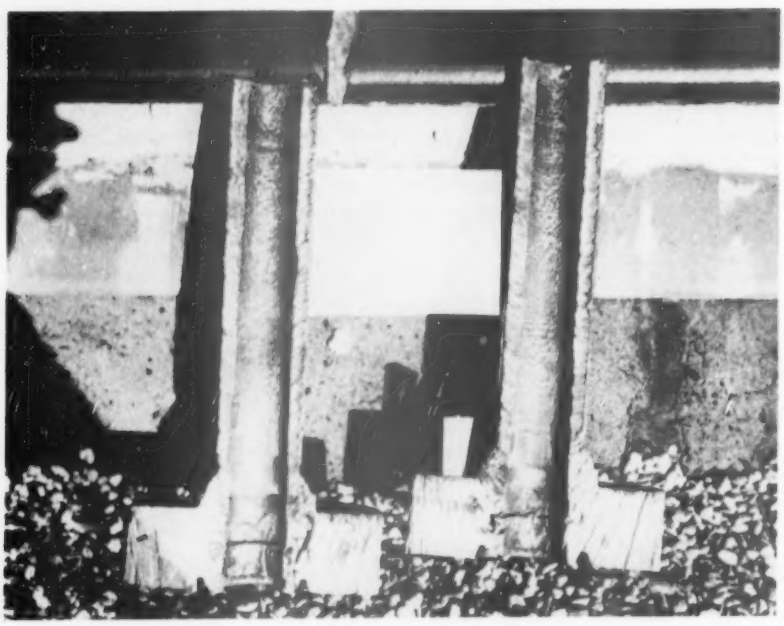


Fig. 5—Showing how regulator nipple failed due to severe corrosion attack.

for 3 days before the gas production was ignited, probably from a rock striking the rig. The rig lasted 7 minutes. Twelve days later this well was brought under partial control.

A 7-in. cross was installed on the casing, and a 4-in. Schedule 80 flow line approximately 1,000 ft. long was connected to each wing of the cross. On each of the two flow lines at a point 700 ft. from the well a "Y" was installed with one line straight to flare and another to a second flare through a 1,000-psi. separator.

Each of the two main lines was handling about 16 million standard cubic feet of gas per day, or approximately 8 million standard cubic feet per day through each flare, exhausting to the atmosphere. Due to the high velocity of the gas no condensate was recovered in either of the two separators.

At times it was necessary to flow the full stream, which was estimated at 32 million standard cubic feet of gas per day, through one of these flow lines. The calculated linear velocity of the gas during these periods was 1,900 ft. per second. At this velocity the gas (no sand was ever detected) was rather erosive. One of the 4-in. ells failed in a short time by having the complete outside portion of the ell eroded away.

When the well was producing approximately 32 million cubic feet per day through the two main flow lines, a limited number of tests were conducted in an effort to determine the bottom-hole pressure. Friction-drop calculations indicated a bottom-hole pressure of approximately 3,500 psi. while flowing the well to the atmosphere.

Back pressure was placed on the well, raising well-head pressures to 1,200 psi. The gas volume produced was not changed a detectable amount. It was concluded that the well was flowing under critical flow conditions at some point in the system, therefore the 3,500 psi. was the minimum possible bottom-hole flowing pressure.

Bottom-hole pressure indicated by the weight of the mud column when the well kicked was in excess of 9,400 psi. Having had some experience with abnormally high-pressure wells, especially the 1 Louisiana State 1299 well, Manila Village field, Jefferson Parish, Louisiana,[1] it was thought that the maximum pressure would be in the order of 14,000 psi. All equipment and further operations were designed for a possible 14,000 psi. bottom-hole pressure.

Meanwhile, Otis Pressure Control Co. installed suitable lubricators so that an overshot could be connected to the drill pipe, which was 7 ft. below the 7-in. cross. Soundings indicated that the drill pipe, which was stuck, was bridged at about 6,980-ft. depth. A string of 1¼-in. drill pipe was obtained, which was used to clear the drill pipe to 10,355-ft. depth. The stuck drill pipe was shot off at 10,360 ft. and the well was killed by pumping in 19 lb. per gallon mud.

This well was later completed in the Klumbhaar sand through perforations at 12,506-50 ft.

No. 2 started . . . As soon as possible after the well blew out the 2 Southdown Sugars, a proposed relief well with a casing program to go into a 14,000 psi. gas zone, was commenced at a location 800 ft. to the west from the blowout well. This well was not completed as a relief well as the No. 1 well was brought under control.

The No. 2 well was drilled to 14,114 ft. where 29-lb. and 32-lb. 7-in. casing was set. After weighting the mud up to 18-lb. per gallon, the well was drilled into the Southdown sand and 537 ft. of 18-lb. per foot 5-in. N-80 liner was run to the producing zone and cemented.

This well was equipped with 14,175

ft. of 2⅜-in. 4.7-lb. per foot 9 per cent nickel-alloy tubing, with Hydril Type CS threads, on a Baker packer. A 15,000-psi. tree was installed. Shut-in surface pressure on the well obtained with bourdon-type gage was 9,800 psi. Since this time a 10,000 psi. deadweight tester was obtained and a shut-in pressure on this well of 9,495 psi. deadweight gage was obtained while the well was leaking.

The surface facilities were designed for handling well-head flowing pressures of approximately 9,000 psi. as in Fig. 1. Considerable conjecture as to the hydrate problem was made while designing the surface facilities; however, a check of an enthalpy-entropy diagram indicated that on initial expansion from well-head pressure to vicinity of 5,000 psi. the gas temperature should increase. See the enthalpy-entropy diagram in Fig. 2.

Constant enthalpy . . . Expansion of the gas through a choke is quite similar to the operation of a steam-throttling calorimeter, which is a constant enthalpy process. It may be noted that the enthalpy at constant temperature for a gas at 9,000 psi. is higher than at 5,000 psi.

It is the authors' understanding that the enthalpy-entropy diagram presented was calculated from pressure-volume-temperature data and with only a moderate number of actual control points. Whereas none of the gases used for Dr. G. G. Brown's charts had the same critical pressure and temperature as the gas produced from the 2 Southdown Sugars well, the similarity between actual conditions encountered in this production and those indicated by the chart was remarkable.

Whereas this performance was indicated by the enthalpy-entropy chart, a little review of thermodynamics may give a clue to predict this behavior.

$$H = U + PV$$

$$\Delta H = \Delta U + \Delta PV$$

For a constant enthalpy process:

$$H_1 - H_2 = 0$$

therefore:

$$U_2 - U_1 = P_1V_1 - P_2V_2$$

If calculated under isothermal conditions the following generalizations may be drawn. When:

$$P_1V_1 - P_2V_2 = U_2 - U_1$$

there is no heating or cooling effect upon expansion. If:

$$P_1V_1 - P_2V_2 < U_2 - U_1$$

there is a cooling effect for the adiabatic system, and in the case where:

$$P_1V_1 - P_2V_2 > U_2 - U_1$$

there is a heating effect for the adiabatic system.

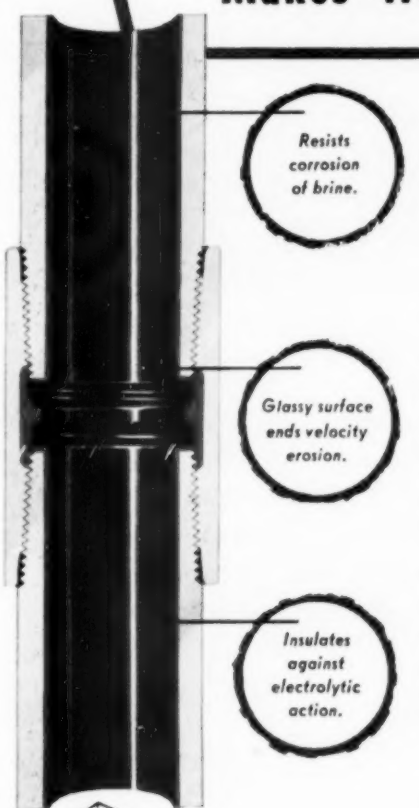
It was noted that in the first expansion of the gas produced from the 2 Southdown Sugars well this heating effect was present. We might also add that this occurs with such gases as hydrogen and helium at room temperature and not too high a pressure.

Obtaining "U" . . . The above quantitative presentation will show whether or not a given gas will heat or cool upon expanding, but the term "U" is rather difficult to obtain. The literature offers another possible solution for this problem in the form of generalized enthalpy-difference charts in which $\Delta H/T$ is plotted against reduced pressure with reduced temperature as a parameter. The plot in Fig. 3 taken from Watson and Smith, National Petroleum News, July 1, 1936, is a typical chart. It may be said that when the first differential of $\Delta H/T$ with respect to Pr is negative it indicates that the gas will show a heating effect upon free expansion under adiabatic conditions.

Wax problem . . . We have experienced considerable difficulty in operation of conventional two-stage separation, in

TUBE-KOTE'S TK-43 LINING

Makes Water-Flood Pay!



Water flooding pays off only when injection costs are low—and costs are low if your injection tubing is given long life by TK-43 lining.

Brine and other water used for secondary recovery corrodes tubing with vicious speed—but *not* if the tubing is guarded by TK-43's triple protection: resistance to the bite of brine; a glassy surface that ends velocity-flow erosion; and a plastic insulation against electrolytic action.

Have your new or existing strings lined with TK-43 now by Tube-Kote experts. If paraffin or similar nuisances are cutting your production profits on other wells, get the story on other Tube-Kote tested products such as TK-2 and plastic pipe.

Write for data or see Tube-Kote pages in Composite Catalog.

TUBE-KOTE, INC.
P. O. Box 20037 • Houston 25, Texas

TUBE-KOTE
First Name In Corrosion Resistance

TUBE-KOTE T.M. Reg

that the high-pressure separator "waxes up" and requires periodic steaming to prevent excess condensate carryover with the residue gas stream. Tests indicate that the stock-tank liquid begins thickening at 99° F. and has a pour point of 60° F.

To facilitate continuous operation it has been necessary to install a parallel high-pressure separator to allow for periodic dewaxing with steam. It has also been necessary to heat the condensate leaving the low-pressure separator. The condensate production from the Southdown sand (14,500 ft.) has a stock-tank gravity of 41.7° A.P.I. and the heptanes plus fraction has a gravity of 38.5° A.P.I. and a molecular weight of 217.

It is our belief that gas produced from reservoirs having higher pressures will probably have more aggravated wax problems. The existence of heavier components in the vapor phase in the reservoir is becoming more generally accepted. Whereas past beliefs indicated that off-colored liquids and dark oils existed in the reservoir in the liquid phase it appears now that a large portion of these could possibly exist in the gas phase. Production history, material balances, and laboratory tests should tend to verify this.

Corrosion too . . . Analysis of the gas produced from the 2 Southdown Sugars well indicated that this gas contained 1.09 mole per cent carbon dioxide. This should give a partial pressure of carbon dioxide in excess of 100 psi. which, based on generalities drawn by the N.G.A.A. Condensate Well Corrosion Committee, should place this well's fluid in the extremely corrosive category.

Due to the high pressures involved we were reluctant to install coupons in the christmas tree. However, water samples caught in a drip pot installed at the heater, operating at approximately 4,000 psi., indicated 200 p.p.m. of iron in the produced water. Visual inspection of the nipple cut from the flow line to install the drip pot showed pitting of approximately 1/32 in. deep had occurred in 5 months.

Plans were formulated and materials requisitioned to determine whether any iron was being dissolved from the 9 per cent nickel alloy tubing by injecting inhibitor into the flow line at the christmas tree and determining iron content reduction at the sample pot. As this plan was being placed in operation the pressure reducing regulator installed on the tree failed (Fig. 4). When removed it was found that the regulator had suffered from rather severe corrosion attack. Inspection of the tree fittings up to the cross showed that corrosion was rather severe. (See Fig. 5).

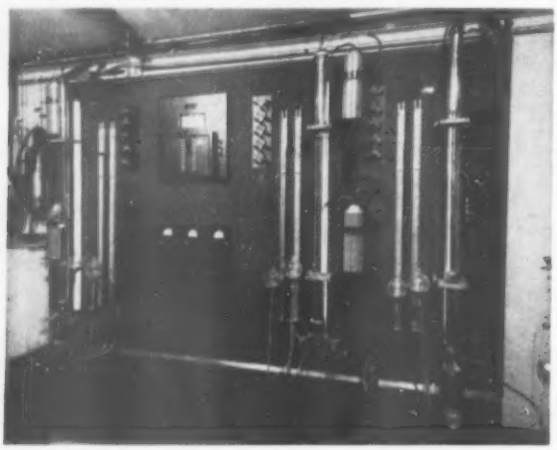
At this time the second well (1 E. B. Elfert Unit) to be completed in the Southdown (high-pressure) sand was placed on production. Produced water analysis indicated 542 p.p.m. of iron. The corrosion control equipment requisitioned for the 2 Southdown Sugars well was transferred to this well and installed to inject chemicals down the tubing to inhibit corrosion of the tubing and protect christmas tree and surface facilities.

As a result of our experience in the high-pressure gas production, especially in South Louisiana, our production department concluded that gas wells with surface tubing pressures of 4,000 psi. or higher would offer corrosion problems.

Tubing strings and facilities are being designed to reduce corrosion costs. This is compatible with data obtained by the N.G.A.A. Corrosion Research Committee, which show that corrosion is likely to occur when the partial pressure of carbon dioxide exceeds 20 psi. Most gas produced from deep wells in South Louisiana contains ½ mole per cent or more of carbon dioxide.

Reference

1. McCaslin, L. S., Jr., Tide Water's Bottom-Hole Pressure 12,635 Psi., The Oil and Gas Journal, September 8, 1949.



ACCURACY

Brought about—through the application of modern science to the Oil Industry. Certain—because of the vast technical experience of our staff. We invite your inquiry, whether your problem is a one-time project or long-range continuing tests.

- ENGINEERS
- METALLURGISTS
- CHEMISTS
- GEOLOGISTS
- TECHNICIANS
- CONSULTING
- ANALYSIS
- RESEARCH
- SPECIFICATIONS
- INVESTIGATIONS
- EXPERT COURT TESTIMONY
- ENGINEERING INSPECTION

KNOW BY TEST

"A hair perhaps divides the false and true"—Omar

TULSA TESTING LABORATORY

TULSA • WICHITA

Savings in Costs Indicated When Employing

LATENT COOLING OF COMPRESSORS

Engine designers should more fully realize its potentials

by H. Menard and E. D. Blossom

THE full potential of latent cooling of engine jackets with boiling water has not been utilized or developed. There are in use three general types of water cooling of engine jackets. These are conventional cooling, hot-water cooling, and latent cooling. After defining these types and comparing their operation, the advantages and potentials of the latent cooling system become apparent. Latent cooling is that method of cooling which transfers the engine heat to the water in the engine jacket by means of latent heat rather than sensible heat. This type of cooling has been variously referred to as vapor phase, boiling point, ebullition, evaporative, etc.

Conventional Cooling

The conventional cooling system shown in Fig. 1, utilizing sensible heat, is found in the vast majority of water-cooled engines. This system consists of a pump to circulate water through the engine, a water cooler for the removal of engine heat, and a surge tank for water capacity and the removal of carbon dioxide and other entrained gases. This system is usually designed for a temperature rise of 10° F. in the water pumped through the engine. A greater water-circulation rate may reduce this temperature rise to 6° F. Some installations are operating with a temperature rise of 15° F. The water entering the engine may be at a temperature level as low as 125° F. or as high as 180° F. This form of cooling will always find an application.

Authors are with Signal Oil & Gas Co. Paper presented at N.G.A.A. meeting at Dallas, April 21-23, 1954.

Hot-Water System

The hot-water cooling system shown in Fig. 2 is quite similar to the conventional cooling method with one notable exception. The hot water from the engine is flashed in a steam separator. The steam is condensed and returned with the water from the separator to the pump. This system is usually designed for a 5° F. temperature rise, but this rise might be as much as 10° F. depending on the amount of water circulated.

The water in the engine is near the boiling temperature, but the majority of the vaporization of the water occurs not in the engine, but in the separator with the release of pressure. Boiling does not occur in the engine because the pressure is maintained by the circulating pump. Although not widely used, the hot-water system has advantages.

Latent Cooling

Latent cooling is essentially different from the two methods described above. In the latent cooling system boiling actually occurs in the engine jacket. As shown in Fig. 3, this system does not necessarily include a pump since circulation may be obtained by thermosiphon. Steam is formed in the engine jacket and is displaced by water from the separating header. The separated steam is condensed and returned to the system with the displaced water.

Because of a very low pressure drop in this system and the fact that the circulating water itself is not cooled, the water throughout the system is at the boiling temperature. If the condensate from the coils is subcooled a temperature rise may occur in the engine jacket. This is to be avoided. Practically a zero temperature rise in the jacket can be realized by proper design.

Not new . . . Latent cooling is not new. Among others the old Fairbanks-Morse Type 2, single-cylinder engine built in the early 1900's with an open cooling-water jacket is a good example. As the water removed the cylinder heat by boiling, it was replaced by raw water makeup. The Bruce MacBeth engine is another example. Henry Ford's Model T utilized the latent cooling system, possibly unintentionally when overheated in warm weather.

In recent years latent cooling installations have been made by Tide Water Associated Oil Co. on four-cycle 300-hp. compressors under the supervision of O. B. Freeman, who has done much toward developing field data. *(See The Oil and Gas Journal, February 23, 1953, page 72.)* Installations have been made by five or six other companies in California with successful results.

Hot-water cooling has advantages over conventional water cooling in that there is less temperature increase of the water passing through the jackets. The higher temperature level reduces the possibility of water condensation with-

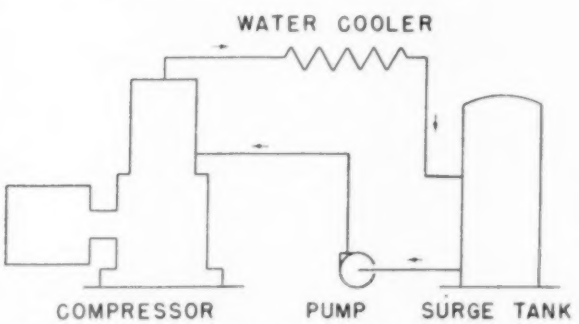


Fig. 1—Conventional engine cooling, works on sensible heat.

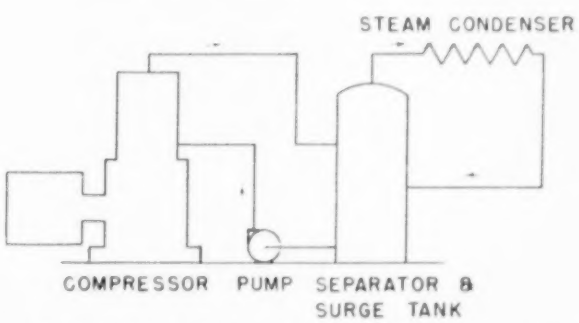


Fig. 2—Hot-water system employs flash in the steam separator.

in the power cylinder. Because of less condensation there is less tendency for corrosion to occur. Initial costs are less because of the smaller cooling surface required to condense the steam rather than cool the water.

Advantages . . . The latent cooling system compared to the conventional and hot-water systems has several distinct operating advantages as shown in Table 1. Latent cooling has little or no temperature rise of the water passing through the engine. In the first two systems cooling depends on turbulence. Even with the best water-jacket design, cooling is not uniform and temperature rise is only an average.

In latent cooling the water is at the boiling temperature and all heat transfer occurs by boiling at that uniform temperature. Thermal expansion or distortion is thereby greatly reduced. With a decreased distortion the piston rings have a better chance of eliminating blowby with a more perfect cylinder-wall contact throughout the power stroke. Less blowby produces less carbon and thus a longer engine life with less maintenance. With less blowby the piston runs cooler. Rod and bearing temperatures are cooler, and less heat is rejected in the oil cooler.

The latent cooling system produces warmer outside cylinder temperatures, which are not objectionable. With less operating equipment, such as the water pump and water-pump engine, fewer failures of operating equipment are to be expected.

TABLE 1—COMPARISON OF OPERATION

	Conventional cooling	Latent cooling
1. Temperature rise	6°-15°	0°-2°
2. Thermal expansion	Distortion	Less distortion
3. Piston blowby	Normal	Less blowby
4. Carbon behind rings and in ports	Normal	Less carbon
5. Piston temperature	Normal	Lower temperature
6. Outside cylinder surface temperature	Normal	Higher temperatures
7. Rod and bearing temperatures	Normal	Lower temperature
8. Oil temperature	Normal	Normal (maintained at manufacturer's recommended temp.)
9. Heat rejected in lube oil	Normal	Less heat (see discussion)
10. Power cylinder corrosion	Normal	Less corrosion (less condensing)
11. Failures causing shutdown	Fans, pump, makeup	Fans, makeup
12. Ring wear	Normal	Less wear
13. Power cylinder wear	Normal	Less wear
14. Carbon in ports	Normal	Less carbon

TABLE 2—COMPARISON OF FACTORS INFLUENCING THE COSTS

	Conventional cooling	Latent cooling
1. Installation:		
(a) Cooling surface	Normal	Less surface required (condensing, better heat transfer coefficient and higher MTD)
(b) Fan	Normal	Less capacity required
(c) Pump	Normal	None required
(d) Pump drive	Normal	None required
(e) Piping	Normal	Short piping required
(f) Lube-oil cooling	Normal	Same or slightly less cooling required
(g) Compressor cylinder cooling	Normal	Same
(h) Controls	High-temp. cutout	Low level shutdown
(i) Surge tank	One to system	Separating header for each engine
2. Operation:		
(a) Pump drive fuel	Normal	None required
(b) Maintenance pump and drive	Normal	None required
(c) Fan drive fuel	Normal	Less fuel required (could be none with turbine)
(d) Water treating	Normal	Similar
(e) Steam available	None	Some available
(f) Maintenance head gaskets	Normal	On engines having rubber seal rings, some gasket replacement required

California Installation

The above statements were based, in part, on Signal Oil & Gas Co.'s installation at Huntington Beach, Calif. That installation consists of two 660-hp. two-cycle oil-cooled-piston compressors operating at 90 per cent rated load. One of the compressors was a new installation. The other was converted from the conventional type of cooling. The latter engine had operated with the conventional cooling for 9 months prior to converting to latent cooling. These two compressors are part of a group of the same model engines with the same compressor load. The other engines in the group are still cooled by the conventional system.

Comparison . . . Because the very same engine has operated on both types of cooling, a good comparison between the two systems can be made. The engine was converted without a major overhaul. After startup with latent cooling, under the same load as with conventional cooling, some changes were noted. The first change was a decrease in the engine-exhaust temperatures. This drop in exhaust temperatures averaged 35° F.

The lubricating-oil temperature was

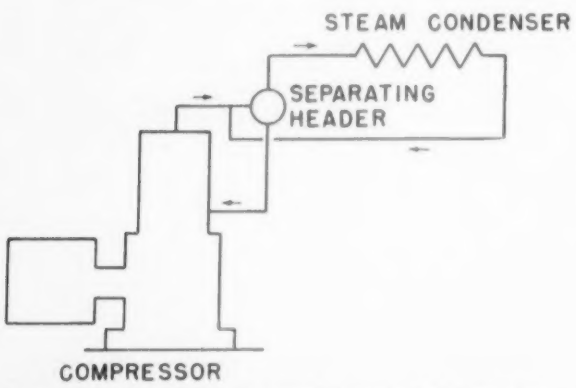


Fig. 3—In latent cooling boiling occurs in engine jacket and circulation takes place by thermosiphon effect.

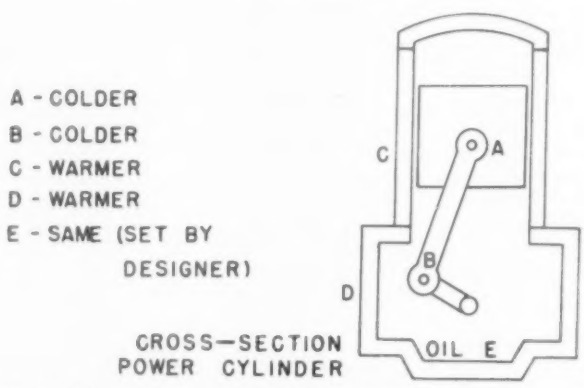


Fig. 4—With latent cooling, the piston is cooler and less heat is passed down piston rod to rod bearings.

also found to drop when the engine was converted. The drop was sufficient to cause the oil temperature to go below the manufacturer's recommended minimum. In order to bring the temperature up, the cooling water going to the same lube-oil cooler was reduced. That indicates a reduction in the heat rejected to the lube oil from the oil-cooled power pistons.

After both engines were operated on latent cooling for a year, they were shut down for inspection. The power cylinders showed no measurable wear. There was very little carbon in the intake ports. Practically no carbon was found behind the piston rings. On the new engine all of the rings except the two first power rings still showed most of the original manufacturer's tool marks on them.

Bearings cooler . . . The maintenance crew reports that the bearings operate cooler with latent cooling. When an engine with conventional cooling is first shut down the power-rod bearings are too hot to handle with the bare hand. With latent cooling the bearings can be handled immediately with the bare hand. In both cases the crankcase oil temperatures were maintained the same by controlling the amount of cooling water circulated through the oil cooler.

In order to explain why the heat rejected in the lube oil is less, observe Fig. 4. With latent cooling the piston is cooler. That is because of less blow-by in the power cylinder, better piston and ring lubrication, better heat transfer from the piston through the rings to the cylinder walls, and better heat transfer through the cylinder wall to the jacket water. Because the piston is cooler, less heat is passed down the piston rod to the rod bearings and the crankcase. Note, however, that the outside surface of the water jackets operate at a higher temperature with latent cooling.

The temperature difference between conventionally cooled outside cylinder temperatures and latent-cooled outside cylinder temperatures is only 30° or 40° F. and is not noticeable, but it does mean that more heat is rejected down the frame to the crankcase. The change in the crankcase-oil temperature with latent cooling depends on which quantity of heat changes the most; the increased heat flow down the frame, or the decreased heat flow through the piston and rod. In Signal Oil & Gas Co.'s operation (two-cycle engines with oil-cooled pistons) the total heat rejected to the oil was found to be less.

Maintenance costs . . . One particular increase in maintenance costs has been observed with latent cooling. The power sleeve, in the above-mentioned installation, is sealed at the bottom from the jacket water by a rubber seal ring. These seal rings bake at the warmer water temperature and become brittle. Once the engine is shut down thermal changes cause cracks in the rubber and water leaks develop. Recent experimental seal rings have shown promise of satisfactory service. This problem is found only in engines that depend on a rubber seal.

Subcooling . . . In order to condense all of the steam that is generated some subcooling of the condensate usually results. If the subcooled condensate is returned to the steam and water line out of the engine the condensate will be reheated on its way to the separating header. (See Fig. 3.)

Surge capacity . . . If more than one engine utilizes the same separating heater adequate surge capacity must be provided. When one engine is started up or shut down, considerable variation of the water level in the separating header is noted. If one engine is shut down on a multiengine system, the steam pockets in the jacket are filled with water from the separating header.

and here's why: It absorbs water instantly from gases and liquids in either a static or flowing system, is insoluble and will not swell or disintegrate in water. FLORITE gives a low dew point depression, and agressively resists "poisoning effects" which permanently destroy adsorption qualities.

Let us prove that Florite is the most economical of the granular agents and best suited to your desiccant requirements, too. Inquiries receive prompt attention.

FLORIDIN COMPANY

Adsorbents
Desiccants
Diluents

Dept. C 220 Liberty Street Warren, Pa.

Water thus used may lower the level in the separating header enough to actuate a low level shutdown switch thus shutting down the other engine or engines connected to the header, if the header has insufficient surge capacity.

Savings in Capital Costs

In a new installation of large compressors considerable saving in capital investment can be realized with a latent cooling system. Referring to Table 2, the condenser is considerably smaller with latent cooling than the conventional cooler, because of the higher heat-transfer rate with a condensing surface. Because of the higher temperature level the temperature difference in the air condenser is greater, thus a smaller air-circulating fan with less horsepower can be used.

Thermosiphon . . . No circulating pump or pump drive is required with latent cooling. The thermosiphon phenomena can provide all of the circulation. With latent cooling the piping requirements are apt to be much less. That is because of the ease of unitizing the engines, thus eliminating the need for long large header systems. The high-temperature cutout and the low-pressure alarms on the conventional system are replaced by safety valves and a low level shutdown on the latent cooling system. The large surge tank in the conventional system is replaced by a separating header or large outlet header for each engine.

The latent cooling system cannot provide cooling for the lube-oil cooler or the compressor cylinders. They may be cooled in the same manner as with a conventional system. A small circulating water system can provide their needs.

Lower Operating Costs

With latent cooling the operating costs are lower than with conventional cooling. No fuel or maintenance is needed for a circulating water pump and pump drive. In the case of the condenser fan less air capacity is required, as noted previously. The fuel for the fan can be eliminated entirely by utilizing some of the energy in the steam generated in the jackets. The steam can operate a turbine to run the fan. (This same fan can also cool the lube oil.)

If a turbine is used, the pressure drop through the turbine must be provided by either elevating the turbine or pumping back the condensate.

Can High-Pressure Steam be Made?

The low-pressure steam that is generated by the latent cooling system is available for use. In fact, in a number of cases the steam generated is used for heating oil. In general, a refinery or natural-gasoline plant has no real need for low-pressure steam. However, if high-pressure steam could be made available in sufficient quantities, boilers could be eliminated. The next logical question is: "Can high-pressure steam be made available with latent cooling?" Calculations indicate that this is possible.

The exhaust temperatures have been found to be lower with latent cooling than with conventional cooling, indicating that less heat is rejected in the exhaust gases. The amount of heat which no longer goes out the exhaust must now be dissipated at some other point in the engine. The heat rejected in the lube oil has been found to decrease slightly. The only other place for the engine heat to go is through the engine cylinder jacket into the water. Latent cooling must therefore increase the heat-transfer rate through the cylinder into the jacket.

Calculations . . . Granting the above statement, what does it mean regarding the generating of high-pressure steam?

With Sapulpa Tank's new *fire belcher!*

We have just recently made a sizable investment in the piece of equipment you see above, and we'll admit we're proud of it! This rolling unit contains eight 400 Amp. Lincoln Welders and one 182 cubic foot air compressor, all hooked by direct, straight-line drive to a D-13,000 Caterpillar Diesel engine. This fire belching monster was custom designed for Sapulpa Tank so that we might speed our erecting service to you. The Sapulpa Tank field erecting specialists now have even better equipment with which to work so let us hear about your storage and gathering-system tank problems.

SAPULPA TANK COMPANY
TANK CONTRACTORS
P. O. BOX 218 SAPULPA, OKLAHOMA

If:

Q_c = heat transferred with conventional system

Q_l = heat transferred with latent system

then:

$$Q_l = (X)\ (Q_c)$$

where:

X = ratio of heat transferred between the latent and conventional systems

Assume:

X = approximately 1.10

Let:

T_p = average gas temperature within the power cylinder

T_w = average water temperature within the jacket

Assume:

$T_{pc} = 950°$ F.

$T_{wc} = 150°$ F.

$TD_c = 950° - 150° = 800°$ F.

where:

TD = temperature difference

The temperature of the gas within the power cylinder is believed to be about 35° less.

Therefore:

$T_{pl} = 915°$ F.

$T_{wl} = 212°$ F.

$TD_l = 915° - 212° = 703°$ F.

The heat transferred in the conventional system then becomes:

$$Q_c = (K_c)\ (TD_c)$$

where:

K = over-all heat-transfer coefficient

The heat transferred in the latent cooling system becomes:

$$Q_l = (K_l)\ (TD_l)$$

The ratio of heat-transfer coefficients is:

$$K_l = \frac{Q_l/TD_l}{Q_c/TD_c}$$

but

$$Q_l/Q_c = 1.10$$

$$K_l = 1.10\ \frac{1/703}{1/800} = 1.25$$

That means that K factor for latent cooling is 25 per cent higher than the K factor for conventional cooling. In a given system if the TD is changed the heat transfer (Q) changes. The conventional cooling system is known to provide adequate cooling. Therefore, the heat transferred by the latent cooling system can be reduced to equal that of the conventional cooling system and still provide adequate cooling.

Let Q_l' = new heat-transfer rate = Q_c

$$Q_l' = Q_c = (1/1.10)\ (Q_l)$$

$K_l' = K_l$ because of the same system.

$$\text{New } TD_l' = Q_l'/K_l' = \frac{(1/1.10)\ (Q_l)}{K_l'}$$

$$= \frac{(1/1.10)\ (K_l)\ (TD_l)}{K_l'} = (1/1.10)\ (TD_l)$$

$$= (1/1.10) \times (703) = 640°\text{ F.}$$

$TD_l = 640°$ F. $= T_{pl}' - T_{wl}'$

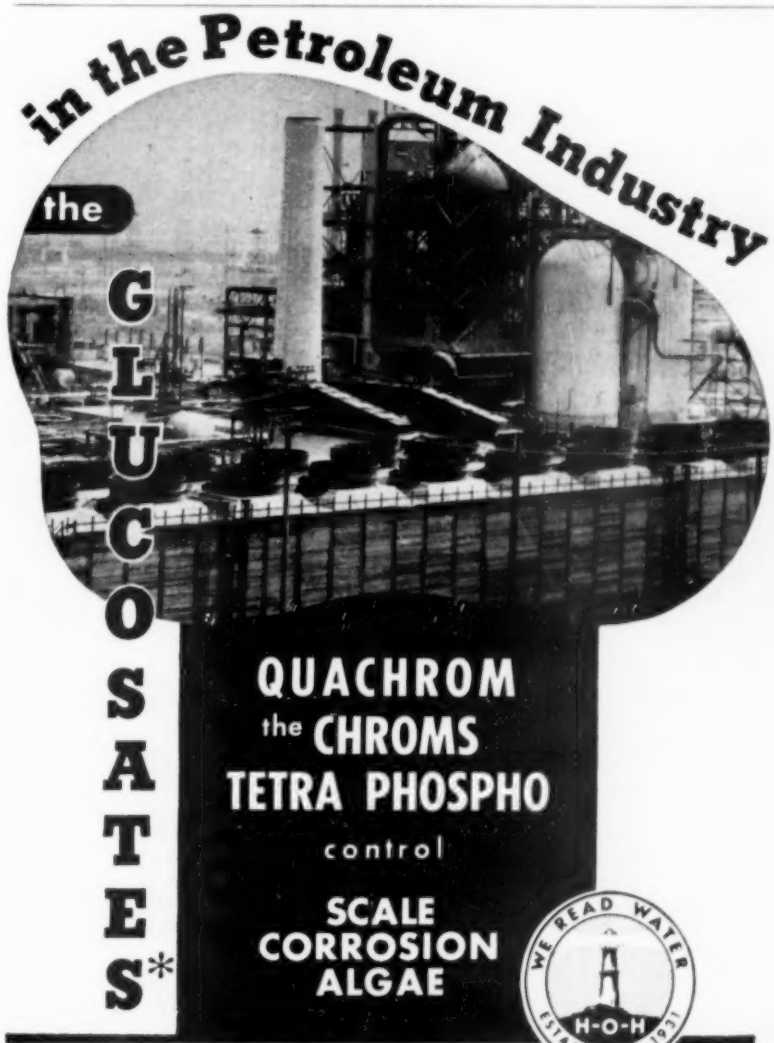
The gas temperature within the power cylinder now becomes the same temperature for that of conventional cooling. That is because the heat transfer rate is the same.

$T_{pl}' = T_c = 950°$ F.

$T_{wl}' = 950° - 640° = 310°$ F.

310° F. steam = 78 psia. = 63 psig.

Steam pressures of 63 psi. are, therefore, now available with no changes in the present latent cooling system. Al-



One Sherman Power Digger Does the Work of *Ten* Men!

The problems of working restrictions caused by limited headroom and closely-spaced columns were solved when this Sherman Power Digger was used to dig trenches for sewer and electrical connections in the basement of the new Oakland Hospital in Royal Oak, Michigan.

In a race against winter, it was decided to pour concrete for upper floors and postpone the basement digging. When trenching could be started, the tractor-mounted Sherman Power Digger was lowered by crane through a small areaway into the basement.

With a single operator, the machine dug a criss-cross pattern of trenches totaling 1500 feet, in hard, dry clay, in just 30 hours. Subcontractor Robert Patton, owner and operator of the digger, estimates that the same digging by hand would have required 320 man-hours.

Thus, even on jobs where it is expensive, impractical, sometimes *impossible* to use heavy equipment . . . Sherman gives you all the advantages of power digging! The Sherman Power Digger is compact, flexible, highly maneuverable . . . gets in and out of tight spots easily . . . moves from job to job at top tractor speeds. Initial cost is surprisingly low, and maintenance is simple and inexpensive. Get all the facts on Sherman Power Diggers now. Write for free literature A12, without obligation.

© SHERMAN PRODUCTS INC., 1954

Sherman

PRODUCTS, INC.

ROYAL OAK, MICHIGAN

Designed, Engineered and Manufactured Jointly by

SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan

WAIN-ROY CORPORATION
Hubbardston, Mass.

•

Patent No. 2,303,825
Other patents pending

ready engines have been operated at 26 psi. with latent cooling.

What would happen if 200-psi. steam were generated? The temperature difference through the engine cylinder wall into the jacket would tend to drop. That drop would cause a decrease in the heat transferred. With less heat transferred the exhaust temperature would tend to increase.

This increase in exhaust temperature should not produce any real problem. An increase in the temperature of the gas within the power cylinder would increase the possibility of preignition. Design changes might have to be made, but the automobile engine of today operates at much higher temperatures and compression ratios without preignition.

The engines that are being manufactured today will not withstand 200-psi. pressure on the water jackets. There is no reason why the engines could not be designed to withstand these elevated pressures.

Most of the available data to date concerning latent cooling have been obtained in the field. There is a need for development on the part of engine designers to realize fully the potentials of latent cooling.

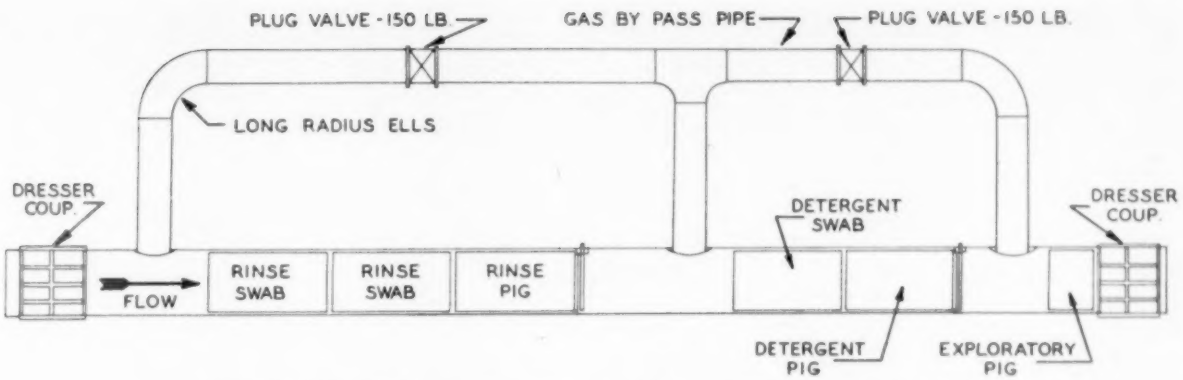
BOOKS

A GUIDE TO TECHNICAL WRITING. Second Edition. By W. George Crouch and Robert L. Zetler. Published by Ronald Press Co., 15 East Twenty-sixth Street, New York 10. 441 pp. $5.

This book on the mechanics of clear and effectual technical writing is designed to fit the needs and interests of those in industry as well as undergraduate students. To exemplify the principles of composition, actual business and engineering letters, reports, technical articles, and speech material are used, and many are taken practically unaltered from the current files of major corporations. Examples of technical exposition are analyzed in detail. The fundamentals of written and spoken English are concisely reviewed and, for reference, a handy index to grammar and usage is included.

HOW TO WRITE REPORTS. By Calvin D. Linton. Published by Harper & Brothers, 51 East Thirty-third Street, New York 16. 240 pp. $3.

This is a practical book designed to help everyone who writes reports to improve his effectiveness. Its principles and methods are equally applicable to government employes, businessmen, scientists, and military personnel. The work is divided into three parts. Part One, Forms, shows the character of the various kinds of reports—what a report should and should not do. Part Two, Methods, gives the specific techniques of preparing a report, and Part Three, Mechanics, offers refresher chapters on grammar and punctuation, on note taking and outlining, and on mechanics of form.



CONTROL JOINT for pigging operation can be loaded in advance of the pigging date. Fig. 1.

Pipe cleaned by new method gives

Flow Efficiency Comparable to New Pipe

with minimum shutdown time

by Clinton McClure

MOST gas pipelines in service 5 years or more are not equipped with full-opening valves and pig traps for on-stream cleaning. A shutdown method has therefore been developed by El Paso Natural Gas Co. which will give maximum flow efficiency increase per dollar invested, with minimum shutdown time.

This method of cleaning gives a flow efficiency within 2 per cent of the efficiency of new pipe.

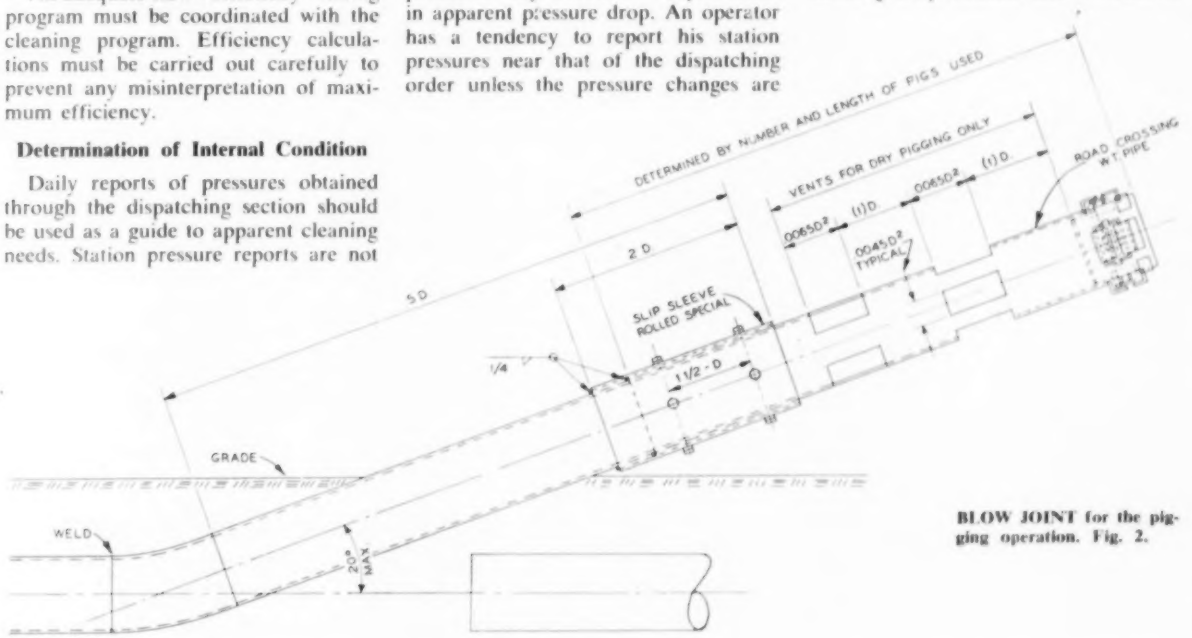
An adequate flow - efficiency - testing program must be coordinated with the cleaning program. Efficiency calculations must be carried out carefully to prevent any misinterpretation of maximum efficiency.

Determination of Internal Condition

Daily reports of pressures obtained through the dispatching section should be used as a guide to apparent cleaning needs. Station pressure reports are not an accurate means of determining pipeline flow conditions. In most cases these pressures are taken with inaccurate instruments. Even if the instruments are accurate, the station piping, gas cleaners and gas coolers may be included in the pressure drop report. These station pressure drops may be excessive, especially if high Reynolds numbers exist there.

If the previous two factors are excluded the human element in reporting pressures may become a major factor in apparent pressure drop. An operator has a tendency to report his station pressures near that of the dispatching order unless the pressure changes are severe. A fourth source of error obtained in dispatching data is storage change. A check into gas accounting will often show a huge unaccounted-for figure.

Since the above errors exist, a flow-efficiency test unit of trained personnel should investigate the apparent pressure drop. For adequate flow-efficiency testing they should be equipped with pressure deadweights, temperature instruments, gravity balance, and a means of



BLOW JOINT for the pigging operation. Fig. 2.

AUTHOR McCLURE and others in discussion group at recent Gas Supply, Transmission and Storage meeting, New Orleans. Left to right are: J. W. Hall, formerly with Transcontinental Gas Pipe Line Corp., Houston, (chairman of pipeline subcommittee); A. L. Roberts, Texas Gas Transmission Corp., Owensboro, Ky.; L. L. Elder, Columbia Gas System Service Corp., Columbus; W. B. Haas, Northern Natural Gas Co., Omaha, (presiding); H. A. Proctor, Southern California Gas Co., Los Angeles; C. C. McClure, El Paso Natural Gas Co., El Paso, Tex.

flow measurement if no measurement exists on the section to be tested. Previous arrangement should be made with the dispatcher to stabilize pressures on the pipeline to be tested. The end pressures on the pipeline to be tested should not change at the rate of more than 1½ lb. per hour.

A station-to-station check should be made first. If the efficiency is below design then a section-to-section check should be made to determine where cleaning would be most effective.

Simultaneous pressures should be taken every 10 to 15 minutes for a period required for the gas to travel from the upstream test point to the downstream one. Sufficient temperatures should be taken along the line to determine the gradient for an average flowing temperature. The specific gravity must be obtained. If more than 1 per cent water vapor exists a dew point should also be obtained.

Evaluation of test . . . A proper evaluation of the test can be made if the following factors are considered. In case of improper pressure stabilization during the test, another test should be run before any decision is made to clean the pipe. If excessive pulsation exists at the plants, pressure test points should be obtained away from them, as far away as the first block valve. Tests have shown that pulsation 8 miles away from a plant is not severe enough to obtain an incorrect pressure reading. If the line is a looped one, the test should be run from station to station with the crossovers open to obtain the maximum efficiency. For the sectional test the crossovers should be closed to prevent one side of the loop from compensating for the other. For accurate data, the loop lines should be separated in the plants if possible. The compensating effect of each side of the loop where the two cannot be separated at the plants affects the central part of the line test the least.

Pressures obtained at the junction of a takeoff line or input line are of little value. This applies to a change of 5 per cent or more in volume. It has been determined that in the case of an outlet, the section upstream of the junction on the main line always shows an efficiency lower than actually exists, with the downstream section higher in efficiency. The opposite is true in case of an input volume. Pressures should be taken 4 to 5 miles away from the junction. The efficiency of a junction section can best be obtained by taking pressures upstream and downstream and obtaining an average flow for the section.

In addition to the above factors an evaluation of the equation used should be made before any decision is made to clean the line. The standard Panhandle A equation will indicate an efficiency lower than exists at Reynolds numbers in excess of 11×10^6 Reynolds number.

Keeping the above factors in mind the decision of where to clean the pipe can be made.

Determination of Cleaning Procedure

Selection of the proper type and number of pigs is important for a good cleaning job. Pigs that do not compensate for wear will not do an effective cleaning job. One-quarter-inch brush loss may mean a loss of force against the pipe wall of 100 lb. if the wear is not compensated. Before the cleaning job is completed a minimum of three wear compensating brush type pigs should be used for each 10 miles cleaned. The cups on these pigs serve mostly as a pressure seal for propulsion.

Squeegee or swab-type pigs with four cups each for each 250 ft. of water wall contact should be placed behind the brush-type pig. All cups should be in good condition so as to do an effective job of removing the water. The body of the squeegee should be sealed watertight.

The pig requirements for 500 ft. of water wall contact should be as follows:

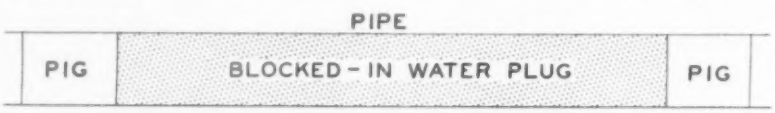
Exploratory—one wear compensating pig.

Detergent run—two wear compensating pigs and 1 squeegee pig.

Rinse run—one wear compensating pig and two squeegee pigs.

This is a large number of pigs, but if the line is to be cleaned properly this number is necessary. Pigs are a capital item and may be used again any time they are needed.

Site preparation . . . The holes around the pipe should be dug in advance of the cleaning date. The pipe should be uncovered sufficiently to insure getting proper slack back in the line after cleaning. If the cleaning operation is located away from a water source, water will have to be transported to the site and stored in advance of the cleaning date. If sufficient storage is available in tank trucks the storage tanks are not needed. A water-injection hole may be incorporated in the pig control



BLOCKING WATER in with two separated pigs. Fig. 3.

joint or any point downstream of the control joint.

The control joint, Fig. 1, can be loaded in advance of the pigging date as another measure in shortening the down time for the gas line. In loading the control joint the pigs for each run should be tied together securely. This will permit the blow joint, Fig. 2, to operate as it should.

The point selected for the start of the pig run should have a natural trap to prevent the water from flowing by gravity down the line for a long distance. Blocking the water in with two separated pigs, Fig. 3, prevents the use of an effective blow joint to catch the pigs. The leading pig will not effectively hold the slug of water together. If the water slug was held together the sloshing action of the water would be lost. This is important in that the sludge must be suspended in the water to do an effective cleaning job. The sloshing action of the water promotes thorough mixing of the pipe-line contaminant with the water.

A large funnel should be fabricated in advance in order to get a thorough mixing of the detergent and water when they are pumped into the pipe. In case the terrain does not permit use of the funnel a mixing tank should be provided.

The blow joints may be transported to the point of use in advance for shorter shutdown time.

Cleaning the Pipe

If the pipe to be cleaned has never been cleaned with type pig selected for this cleaning job, the exploratory run is a time-saving operation.

The exploratory pig may be placed in the control joint or in the pipe downstream of the control joint after the pipe has been cut. The exploratory pig helps loosen up the pipe contaminant in advance of the detergent run.

Water and detergent run . . . The use of water and detergent in pipe-line cleaning is not being accepted as it should. The fear of leaving water in the pipe causing freezeups has delayed an extensive use. If the proper number of squeegees are used the amount of water left in the pipe will not be detrimental to gas transmission. To this date more than 500 miles of company pipe has been cleaned with water and no line freezeups can be attributed to loss of water in a pigging operation.

As further proof to the amount of water left in the pipe, the ammonia-displacement method of flow measurement has been used in the section 24 hours after pigging. In order to detect the ammonia it must be in the form of NH_3. Almost an equal liquid volume of water to that of NH_3 is required to completely saturate NH_3 to form NH_4OH. In this state it is not carried by the gas stream and thus cannot be detected. The displacement test was carried out by using a maximum of 1½ gal. of NH_3 in the liquid state. Thus, not more than 2 gal. of water could have been left in the pipe after water cleaning.

The use of 75 lb. of 10 to 11 pH detergent per 1,000 gal. of water will usually insure sufficient suds to remove all traces of lubricating oil or other types found in the pipe. This may be increased to suit the need. If no suds exists in the water when discharged from the pipe it may be assumed that the detergent was not strong enough for the water used, with the possibility that all the oil was not removed.

The detergent may be shoveled in the flowing water stream through the funnel in the first 200 gal. of water. The funnel is removed and the remainder of the water pumped in ahead of the pigs. The retaining pin is then removed from the first set of pigs. The control-joint valves are opened for propulsion of this set and pressure admitted. A 20 per cent increase in pressure above that required to move the pigs and water will generally maintain sufficient propulsion force to keep them moving.

Turn Pipe Dreams Into Pipe Bends!

Pipe bending is more simple than ever with a PEDRICK BENDING MACHINE for either production or job bending.

They are being used by many Oil and Chemical companies throughout the nation for piping installations on the actual job site or in the pipe fabrication shop.

The bending machine shown has a bending capacity in I.P.S. of 2″ extra heavy. Other models are available up to 6″ extra heavy I.P.S. All Benders are shipped complete with motor and all electrical equipment including automatic duplicate bending relays.

PEDRICK TOOL & MACHINE CO.
3640 N. Lawrence St.
Dept. 9 Phila 40, Pa., U.S.A.

After one-third of the distance has been covered any adjustment of pressure may be made to correct the speed to between 7 and 12 m.p.h. Control after one-third the distance has been covered is difficult to maintain. Speeds in excess of this will not adequately clean the pipe. In addition, high speeds will cause excessive loss of water. Lower speeds do not materially affect the cleaning job but increase shutdown time.

Cleaning with water and detergent should be limited to a 10-mile run. Cleaning more than 10 miles each time would be like washing dishes in a restaurant all day with the same batch of water. Cleaning more than 10 miles with an increased amount of water would be limited by the number of squeegees used.

Test shows that a minimum of 500 ft. of water wall contact should be used for best results. The maximum should not exceed 100 ft. of water wall contact per squeegee cup used.

Rinse run . . . An equal amount of rinse water to that of detergent water should be used. The retaining pin for the rinse pigs is removed after the rinse water has been pumped in. The pressure is admitted by the same rule as in the detergent run. In most cases the pressure required to run the rinse pigs is greater than that of the detergent run. Other than having more squeegee cups in action on the rinse run, the higher pressure required may be attributed to the rinse solution carrying more loosened up material.

Experience has shown that the rinse water ejected is more discolored than the detergent water. If the section was 20 per cent below maximum before cleaning a better cleaning job can be obtained through a second rinse.

Testing the Pipe Cleaned

The station-to-station effect of the cleaning job should be determined to insure that a sufficient amount of pipe has been cleaned to bring the entire line up to design efficiency. If not, additional cleaning should be carried out. In the case of a single line the absolute efficiency increase can be determined on the part cleaned after cleaning.

The cost of cleaning varies from $346 per mile for 30-in. to $70 per mile for 6-in. This depends on availability of water to be used.

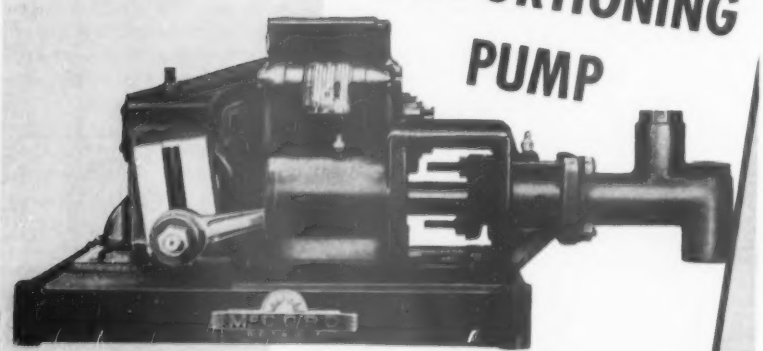
If little is known about the equation used to determine the efficiency, flow conditions similar to those previous to cleaning should be set up for the after-cleaning test.

Evaluation . . . After obtaining the results of the cleaning operation the cleaning procedure may be altered to fit the condition of the pipe in order to obtain a greater efficiency increase. The appearance of the discharge "crud" is not always an indication of the progress made. One barrel of roughly applied crud to the pipe interior may cause a greater efficiency loss than 10 bbl. of the same crud scattered out along the bottom of the pipe.

Tabled below are efficiencies before and after cleaning based on the Panhandle A equation with an E factor of 1.00.

Pipe o.d. (in.)	Section length (miles)	Eff. before	Eff. after	Eff. increase
8⅝	7.91	76.6	86.5	9.9
8⅝	7.99	75.1	87.1	12.0
8⅝	8.33	80.4	90.3	9.9
8⅝	7.85	73.2	82.6	9.4
16	9.47	82.2	89.8	7.6
16	7.48	84.9	91.5	6.6
16	9.47	80.4	86.1	5.7
16	7.48	73.0	82.2	9.2
16	10.13	72.2	87.5	15.3
16	9.52	72.7	86.5	13.8
26	8.022	85.6	91.4	5.8
26	7.876	75.4	86.2	10.8
26	8.106	80.1	87.5	7.4
26	9.095	77.7	84.1	6.4
26	9.15	69.8	84.4	14.6
26	8.68	67.2	83.7	16.5
Average		76.6	86.7	10.1

McCORD Class "M" CHEMICAL PROPORTIONING PUMP



Above unit suitable for handling up to 85 GPH. Designed for accurately controlled chemical proportioning service.

FEATURES of McCORD CLASS "M" PUMP

1. Easily accessible suction and discharge valves.
2. New valve design. Highly efficient and easily serviced.
3. New improved type packing, with large stuffing box.
   Reduces necessity of frequent adjustment and does an excellent job of sealing. Available in a range of materials to suit the chemical being handled.
4. Provision for flushed packing.
5. Removable pump unit. Cast iron pump body with stainless plunger standard. All stainless construction available.
6. Positive drive unit. No lost motion.

McCord's half-a-century of experience, covering every phase of engineering development and manufacturing of measuring devices for the lubrication of Diesel, gas and steam engines, and compressors, as well as every type of industrial machinery, provides a background for the class "M" pump.

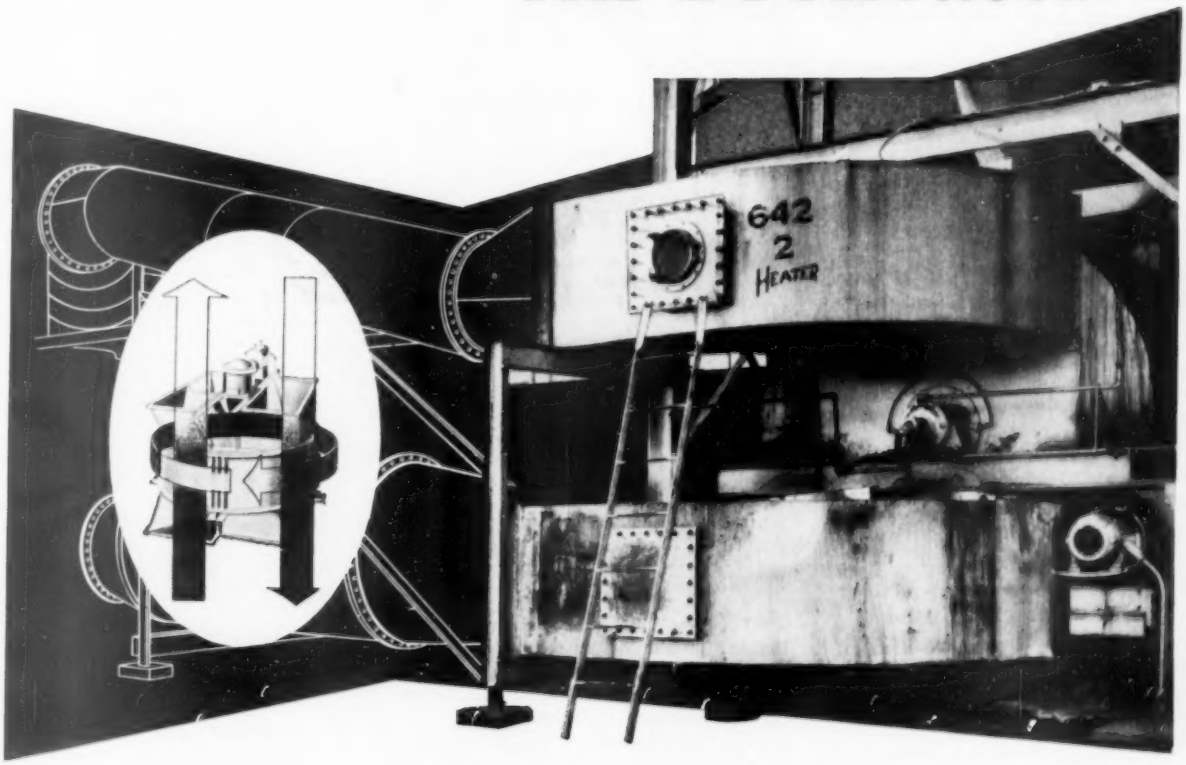
Special tanks, agitators and meter controlled units designed and available.

Complete engineering data and service available, if you will write us your problems.

McCORD CORPORATION • Detroit 11, Michigan

Replace Still Convection Surfaces . . .

. . . with a Ljungstrom Air Preheater



In purchasing new equipment — or modernizing existing equipment — one way to save impressive amounts of capital as well as operating expense is to design for a Ljungstrom Air Preheater.

Because the Ljungstrom promotes such greatly increased heat liberation in the furnace, the convection bank of oil tubes can generally be eliminated from the design. This can in itself *more than pay the cost of the Ljungstrom installation.*

Add to this the proved fuel savings . . . the higher product quality . . . greater throughout possible with a Ljungstrom — and you will see why the Ljungstrom is an eminently practical piece of equipment to be considered wherever fuel is burned.

In these days of high fuel costs and skyrocketing demands for petroleum products, every refinery should consider a Ljungstrom whenever equipment is being purchased or modernized. Call or write The Air Preheater Corporation for complete details.

Wherever You Burn Fuel, You Need LJUNGSTROM

THE AIR PREHEATER CORPORATION
60 East 42nd Street, New York 17, N. Y.

HOW SHELL SAVES PIPE...

by use of new reduced casing-string-design factors

by J. E. Saye and T. W. G. Richardson

SHELL OIL CO. makes a saving of approximately $1,000 for 10,000-ft. casing strings in the Elk City, Okla., field by using lower-than-conventional design factors.

Besides making possible the use of cheaper, lighter-grade pipe, the reduced factors greatly facilitate the design of casing strings for greater depths.

As a result of successful experimentation Shell has reduced the factor for tension from the conventional 1.60 to a value of 1.40. For cemented casing, the factor is reduced from 1.00 to 0.85. For uncemented pipe, it was not found possible to reduce the factor below the conventional 1.00.

An analysis of the cost of wells drilled in the Mid-Continent area by Shell during 1953 shows that casing represents 27.5 per cent of the drilling cost. Obviously, then, casing-string design is an engineering problem of great importance.

During the early part of World War II, Shell had adopted a standard method of casing-string design using the following design safety factors: 1.60 for tension, 1.00 for collapse, and 1.33 for burst. Since adopting this method, a great number of casing strings have been run and no failures have been attributed to the design method or the design safety factors used.

This absence of failure was good reason for believing that the design safety factors in use were conservative and might be reduced. Therefore, in May 1952, Shell undertook a field test program to determine whether or not collapse and tension design safety factors could be lowered.

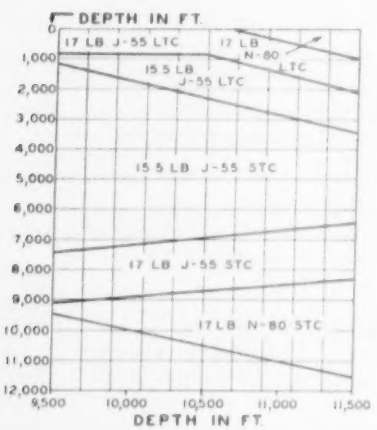


Fig. 1—This chart was the standard design for Shell's 5½-in. casing strings in the Elk City, Okla., field before tests to reduce design factors began.

Others' practice . . . There seems to be little uniformity in the design safety factors used. A recent survey conducted by an oil company operating in the Mid-Continent area showed that the following design factors are used:

Company*	Collapse Design Factor	Tension Design Factor	Burst Design Factor
A	1.125	1.80	1.00
B	1.125	1.80	1.10
C	1.125	1.75	†
D	1.17	1.75	1.75
E	1.00	1.60	1.33
F	1.125	1.60	1.00
G	1.125	1.80	1.10

*Not necessarily in the order given, these companies were: Shell Oil Co., Stanolind Oil & Gas Co., Phillips Petroleum Co., Gulf Oil Corp., Deep Rock Oil Corp., Carter Oil Co., and Sunray Oil Corp.

†Not calculated.

In general, those companies base their design upon A.P.I. minimum yield strength values but limited use is also made of ultimate strength values. Some companies use actual mud weight in design, whereas others use the weight of salt water. In general, buoyancy is neglected but usually biaxial stress curves are used to determine the reduction of collapse resistance due to tensile load.

Shell's practice . . . In designing for collapse, the full mud column pressure is presumed to be applied on casing empty of fluid (i.e., an internal pressure of 0 psig. is assumed), buoyancy is neglected, but biaxial stress curves are used to determine the effect of tensile load on collapse resistance.

In designing for tension the free hanging weight, calculated in air, is used, buoyancy is neglected, and the tension design factor is based on A.P.I. minimum joint pull-out strength.

Burst strength is usually not critical but calculations are made based on the maximum anticipated internal pressure and external pressure is presumed to correspond to that of a column of salt water.

This design method was used to prepare the normal 5½-in. casing-string design chart, Fig. 1, for the Elk City field. Prior to the field testing of casing string design factors, this was Shell's standard design for the field.

Tension Tests

In conducting tests of tension design factors, casing strings were designed and run in the usual manner. Tension design factors, calculated on the basis of the casing weight in air and A.P.I. minimum joint pull-out strength, were progressively lowered in successive casing strings in accordance with the following schedule:

Test number	Test design factor
1 and 2	1.55
3 and 4	1.50
5, 6, and 7	1.45
8	1.40

In the event of tensile failure, repair would have been facilitated as that portion of the casing string being tested was always inside the salt string.

All eight of the tests were conducted without failure. Fig. 2 illustrates the comparison of a 1.60 and a 1.40 design factor for tension in a casing string for a well 11,000 ft. deep. Following the successful completion of these tests, a tension design factor of 1.40 was accepted as standard for Elk City field and, to date, 40 oil strings of this design have been successfully run and cemented at depths from 10,000 to 11,000 ft.

If the buoyancy of the mud and the reciprocation load are considered, tension design factors for these tests would be lower than those calculated when these factors are neglected.

Collapse Tests

Testing collapse design factors was much more complicated than testing tension design factors, and a sketch is shown in Fig. 3. In each test the portion of the casing string above the test section was designed in our usual manner. The three lengths of casing to be collapse-tested were run on the bottom of this string and collapse tests were obtained by conducting drill-stem tests inside the casing.

In every case the collapse-tested sec-

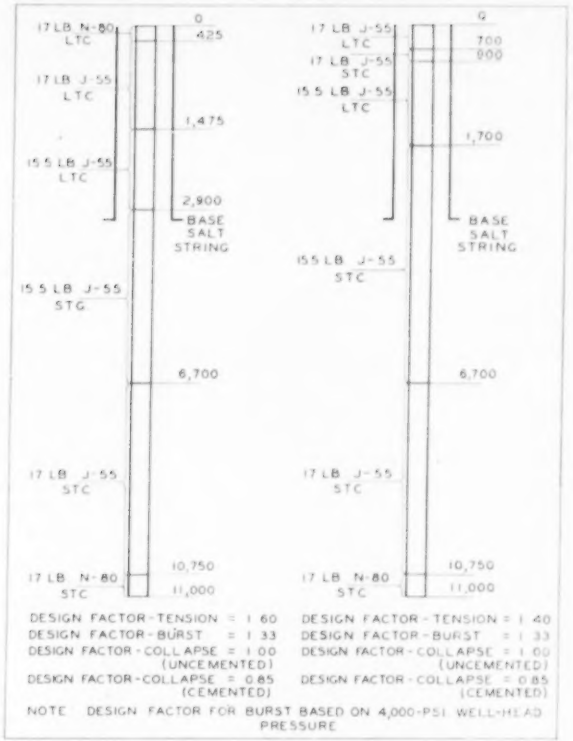


Fig. 2—A comparison of casing strings with 1.60 and 1.40 design factors for tension.

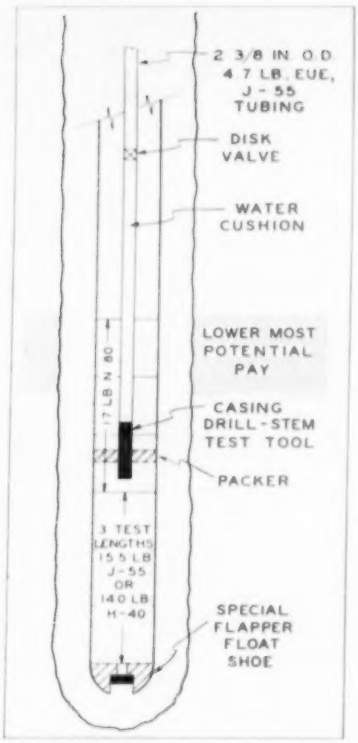

2 3/8 IN. O.D. 4.7 LB. EUE, J-55 TUBING
DISK VALVE
WATER CUSHION
LOWER MOST POTENTIAL PAY
17 LB N 80
CASING DRILL-STEM TEST TOOL
PACKER
3 TEST LENGTHS 15.5 LB J-55 OR 14.0 LB H-40
SPECIAL FLAPPER FLOAT SHOE

Fig. 3—A drill-stem test tool was used in collapse design factor tests.

tion of casing was below all commercially productive zones, and the use of a flapper-type float shoe without a float collar permitted the casing string to be drifted to bottom after each successive collapse test.

Every string was equipped with centralizers and reciprocating scratchers in the manner previously described. After the casing was run in the well it was landed on slips and drifted to bottom with a drilling bit run on tubing. The casing was also drifted with a bit after each successive collapse test.

Collapse tests were obtained on both uncemented and cemented casing by conducting drill-stem tests inside the test section. The test tool packer was set in the last length of casing of the normally designed string, and the differential collapse pressure desired was controlled by varying the amount of water cushion placed in the tubing.

Collapse design factors for the test section, calculated from the differential between external mud column pressure and internal water cushion pressure, were progessively lowered in increments of 0.05 until the casing collapsed or until a test was obtained with zero internal pressure.

All casing used in the collapse-tested section was pressure tested to 80 per cent of minimum yield pressure (440 psi. for 5½-in., 15.5-lbs., J-55 casing). Also, the weight, drift, minimum wall thickness, and eccentricity of each length were checked.

Results of five tests . . . In all, five collapse tests have been conducted, summarized as follows:

Collapse test No.	Design factor tested	Design factor* at which collapse occurred
1 (uncemented)	0.95, 0.90, 0.85, 0.80	0.80
2 (uncemented)	0.95	0.95
3 (uncemented)	0.95, 0.90, 0.85	0.85
4 (uncemented)	0.95,0.90	†
(cemented)	0.85, 0.80, 0.75	†
5 (uncemented)	0.90	†
(cemented)	0.75, 0.70, 0.60, 0.50	†

*Note that the effect of tension on collapse is not considered because bottom joints have no tensile load.

†Casing did not collapse.

All of the above collapse design factors were calculated from A.P.I. minimum collapse strengths. For convenience, the collapsing force for both uncemented and cemented casing were assumed to be that imposed by the differential between a full external mud column and water cushion pressure. The validity of this assumption is discussed later in this paper.

Although collapse failure was experienced on three of the five tests, the well casing was successfully cemented through perforations on the occasion of each failure.

However, in all cases the casing was frozen and could not be reciprocated. This caused difficulty in cementing and several expensive squeeze-cementing

THE AUTHORS

SAYE

RICHARDSON

J. E. Saye is division mechanical engineer for Oklahoma with Shell Oil Co., Oklahoma City. He is a graduate of University of Texas with a degree in mechanical engineering. Saye joined Shell after graduation in 1947, and has been district engineer for the company in Great Bend, Kans., and Elk City, Okla., before his present assignment.

T. W. G. Richardson is area drilling engineer with Shell in Tulsa. He is a graduate of University of Tennessee in electrical engineering, and joined Shell after receiving a master's degree in electrical engineering from Georgia Tech in 1947. Richardson has served in several other capacities with Shell in Midland, Tex., and Oklahoma City.

The accompanying article is an abridged version of a paper presented at the A.P.I. Mid-Continent district meeting, Division of Production, Oklahoma City, March 17-18.

HILCO

LUBE and FUEL OIL PURIFICATION . . .

GET RID OF DIRTY OIL . . .
GET LOWER OPERATING COSTS
LONGER EQUIPMENT LIFE

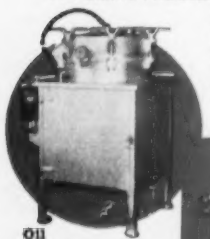
HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all times reduces down time, increases production and HILCO units pay for themselves in savings.

HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

● *THERE'S A* **HILCO** *FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM*

HILCO has 25 years experience in oil purification. Let this experience work for you.



Oil Reclaimer

PURIFIERS
FILTERS
RECLAIMERS
CONDITIONERS

A complete range of sizes and systems for oil purification.

Filter

★ *WRITE FOR* **FREE** *LITERATURE NO OBLIGATION ON YOUR PART*

THE HILLIARD CORPORATION
23 W. FOURTH ST.
ELMIRA, N. Y.

IN CANADA — UPTON-BRADEEN-JAMES, Ltd.
890 Yonge St., Toronto. 3464 Park Ave., Montreal

jobs were needed to obtain a good cement sheath behind the pipe.

Recorders show variation . . . In the first two collapse tests, calculated design factors were slightly different from those indicated by the two pressure recorders in the test tool. In reviewing the procedure used and results obtained on these initial tests, it was concluded that erroneous mud-column and water-cushion pressures were recorded.

The error in recorded mud-column pressure was a result of piston effect in running the packer and packer "squeeze." This procedural inaccuracy was reduced in subsequent tests by permitting pressure above and below the packer to equalize before the packer was set and by waiting 30 minutes before opening the test tool.

Typical bottom-hole pressure charts are illustrated in Figs. 4 and 5. Another

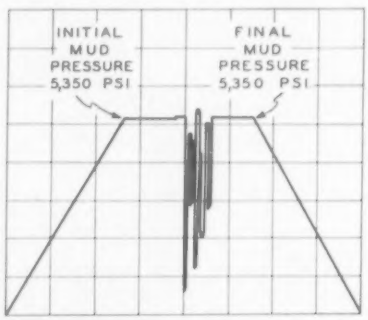


Fig. 4—This bottom-hole pressure chart shows a failure in the collapse test.

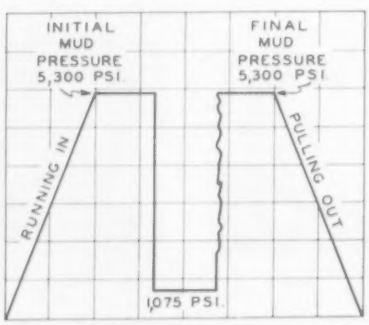


Fig. 5—A successful test of collapse design is shown by this bottom-hole pressure chart.

source of error, especially noted on recorded water cushion pressures, was rationalized by an investigation of instrumentation limitations. It was determined that the magnitude of errors noted corresponded closely to the inherent limitations of the instruments used, these limitations being due primarily to spring hysteresis and calibration.

The use of the above procedural changes, carefully selected instruments, and carefully read data on later tests resulted in much closer agreement between calculated and measured values. The magnitude of difference was then considered within the range of experimental accuracy.

In the first collapse test the casing collapsed at a design factor of .079 after successfully withstanding tests at design factors of 0.95, 0.90, and 0.85. On Test No. 2 the pipe collapsed at a design factor of 0.95. Casing used in Test No. 3 successfully withstood design factors of 0.95 and 0.90 but collapsed at 0.85.

On fourth test . . . After studying the results of the first three tests, the fourth test was successfully conducted on uncemented casing at design factors of 0.95 and 0.90. As the test section was not collapsed, the casing was cemented in the normal manner and three tests were conducted on the cemented casing in an attempt to evaluate the effect of cement behind the pipe on casing collapse. If calculated on the same assumption as for uncemented casing, design factors on these tests were 0.85, 0.80, and 0.75 and the pipe was not collapsed.

No water cushion was used in the last of this series of tests, which, based on calculated mud-column weight, would correspond to a design factor of 0.75. However, if after cementing, the external pressure on the pipe is instead equal to formation pressure, the design factor would be 0.83 if a formation pressure gradient of 0.442 psi. per foot is assumed.

To check the validity of results obtained in Test No. 4, another collapse test was conducted. In this test three lengths of 5½-in.-o.d., 14-lb., H-40, STC casing were used in the test section, whereas previous tests had used 5½-in. o.d., 15.5-lb., J-55, STC casing.

This H-40 casing successfully withstood collapse pressures corresponding to a collapse design factor of 0.90 when uncemented and design factors of 0.75, 0.70, 0.60, and 0.50 after the casing was cemented. However, for convenience, all design factors were again calculated on the basis of full mud-column pressure outside casing and water-cushion pressure inside, even though pipe was cemented for the last four tests.

Results questioned . . . There is some doubt that cemented casing was actually collapse tested. Our reason for questioning these results is that the zone opposite the cemented collapse test section was of such low permeability that formation pressure might not have been sufficient to obtain the design factors mentioned above.

In the well used for Collapse Test No. 5 the collapse test section was located between 10,755 and 10,852 ft. in an interval having no permeability of

IVERSON SUPPLY *NOW OFFERS*

A FULL LINE OF

OIL INDUSTRY TUBULAR GOODS

You can now get whatever you need in the way of Drill Pipe, Casing or Tubing, either seamless or electric weld, from your nearest IVERSON SUPPLY STORE. Recent arrangements for the handling of Colorado Fuel and Iron and Lone Star Steel products make it possible for us to take care of all your tubular goods requirements. You get the same dependable service and the same prompt action which have made IVERSON SUPPLY STORES the first choice of thousands of oil men for nearly 30 years.

Call, wire or write your nearest IVERSON store or office regarding your needs for casing, tubing, drill pipe or line pipe.

FIELD STOCKS CARRIED AT THE FOLLOWING POINTS:

Artesia and Farmington, New Mexico
Oklahoma City and Okmulgee, Oklahoma
Kermit, Odessa and Snyder, Texas
Price, Utah

SUPPLIERS AND PRODUCTS:

PITTSBURGH STEEL COMPANY
Seamless Casing, Tubing & Drill Pipe
THE COLORADO FUEL AND IRON CORPORATION
Seamless Casing and Tubing
WHEELING STEEL CORPORATION
Steel Line Pipe
LONE STAR STEEL COMPANY
Electric Weld Casing and Tubing

OFFICES:
DALLAS
FORT WORTH

IVERSON SUPPLY COMPANY

DRILLING-PRODUCTION AND REFINERY EQUIPMENT
P. O. BOX 1439 TULSA 1, OKLA.

OFFICES:
MIDLAND
TEXAS

THE SHOW MUST GO ON

Its ability to take it and carry on has established Naylor lightweight pipe as a star performer in gas-gathering service. The extra collapse strength provided by Naylor's exclusive lockseam-spiralwelded structure plus ease of handling and installation have earned top billing for Naylor—under pressure or under vacuum. If this is the kind of performance you need, write for Naylor Bulletin No. 507.

NAYLOR PIPE

Naylor Pipe Company . 1232 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Exclusive Distributors in Mid-Continent and Gulf Coast Areas

Mid-Continent Supply Company, Fort Worth, Texas and Branches

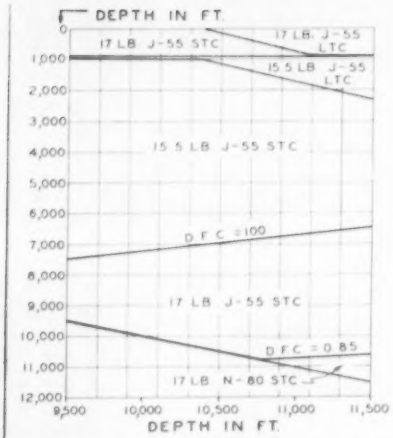


Fig. 6—After completion of tests on design factors, this became Shell's standard chart for casing-string design in Elk City field.

commercial significance. Even so, the zone of highest porosity and permeability in this section of the hole had been open-hole drill-stem tested in the interval from 10,812 to 10,827 ft.

This open-hole test recorded a bottom-hole formation pressure of only 1,010 psi., both open and shut-in, indicating no entrance of reservoir fluid. Therefore it was our opinion that cemented casing in the test section of this well might not have been subjected to a collapse pressure greater than that corresponding to a design factor of approximately 3.0.

Our reason for considering this factor lies in the belief that cement effectively bridges the annulus between casing and open hole, if the cement job is good, relieving cemented casing of external pressure due to the mud column, thereby only subjecting cemented casing to collapse forces due to formation pressures.

Because it is doubtful that an impermeable formation could exert a collapsing force, such forces can be applied on casing and cement only by porous, permeable formations having pressures sufficiently greater than internal casing pressure.

Credence is given the test results because 40 strings of the above design (Fig. 6) have been run in Elk City field wells without any difficulty whatever.

Big Steel User

The gas industry used approximately 1,725,000 tons of steel in 1952, principally in line pipe. The tonnage for 1953 was higher, since more miles of pipe were laid in 1953 than a year earlier. However, the gas industry estimates that it will require 7.3 million tons of steel pipe for its expansion program from 1953 through 1956. The major part of this tonnage will represent steel pipe of 16-in. diameter or larger. Approximately 5 million tons of steel will be required for the large-diameter pipe.

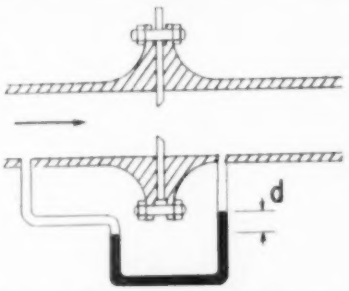


Fig. 1 — Sharp-edged orifice plates and clear meter runs are necessary for accurate metering. Note that manometer connections are flush with inside surface and are free from burrs.

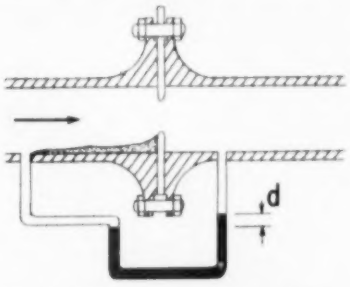


Fig. 2—Rounded edges on orifice plate or dirt in meter run will tend to streamline flow and give a smaller differential pressure.

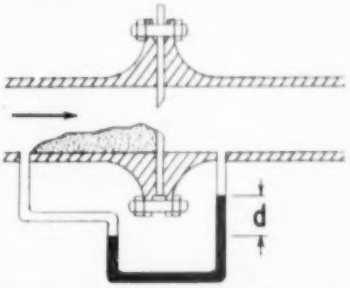


Fig. 3—Dirt accumulation which partially blocks orifice will cause higher turbulence and greater differential pressure.

What you should know about

Orifice-meter measurement

by W. R. Kehoe*

STRICT adherence to the American Gas Association specifications is necessary if accurate measurement of flow rate is to be obtained with the use of "orifice meters." The orifice meter must be thought of as a combination of the orifice plate, meter run, gage lines, differential gage, and static pressure element. It is necessary to have a thorough understanding of these component parts if effective maintenance and accurate metering is to be obtained.

Orifice plate and meter run . . . Probably the most important requirement for the orifice plate is that the upstream edge be square and sharp so as not to appreciably reflect a beam of light. See Fig. 1. Various other specifications, such as those for flatness and edge width, should also be followed, since deviation from established specifications might result in an accumulation of additive errors. Even if the meter run and the orifice plate were installed according to specifications, continued usage might give rise to conditions which could cause great error in measurement. These conditions are as follows:

1. The upstream edge of the orifice might become rounded because of abrasive material in the gas or flowing fluid. A rounding of the orifice edge results in a low differential reading with consequent low measurement. An accumulation of dirt on the upstream face of the orifice might be the equivalent of a rounded upstream edge, since it would tend to streamline the gas approaching the orifice. See Fig. 2.

2. Small pits on the front or back side of the orifice plate ordinarily do not make so much error in measurement as is sometimes thought; however, pits will eventually lead to trouble, particularly if they are anywhere near the edge of the plate on the upstream side. While small nicks on the upstream edge are not to be condoned, the resulting errors are not nearly so serious as those which are brought about when the entire circumference of the hole has a slight radius on the upstream edge. In other words, anything which distorts the entire circumference of the hole in the orifice plate can produce a much greater error than a small nick at one point on the circumference.

3. An accumulation of dirt in the meter run ahead of the orifice plate could cause either low measurement or high measurement, depending upon the amount of the buildup. If the buildup did not obstruct the orifice opening, its effect would be a streamlining of the flow lines, a decrease of differential pressure, and low measurement. If the buildup were sufficient to partially obstruct the orifice, the differential pressure reading would increase and the measurement would be high. See Fig. 3.

4. A change in the inside surface finish of the meter run will cause a distortion of flow from that corresponding to the conditions for which the meter coefficients were originally determined. Roughness on the inside surface of the pipe beyond that of standard selected pipe will usually cause a decrease in differential pressure and low measurement.

Periodic inspection of the meter run and orifice plate will insure against any deviations from proper conditions. The type of measurement and flowing condition will dictate how frequently such inspection should be made. With new lines, where there is a possibility of hydrates, dust, etc., more frequent examination will be required.

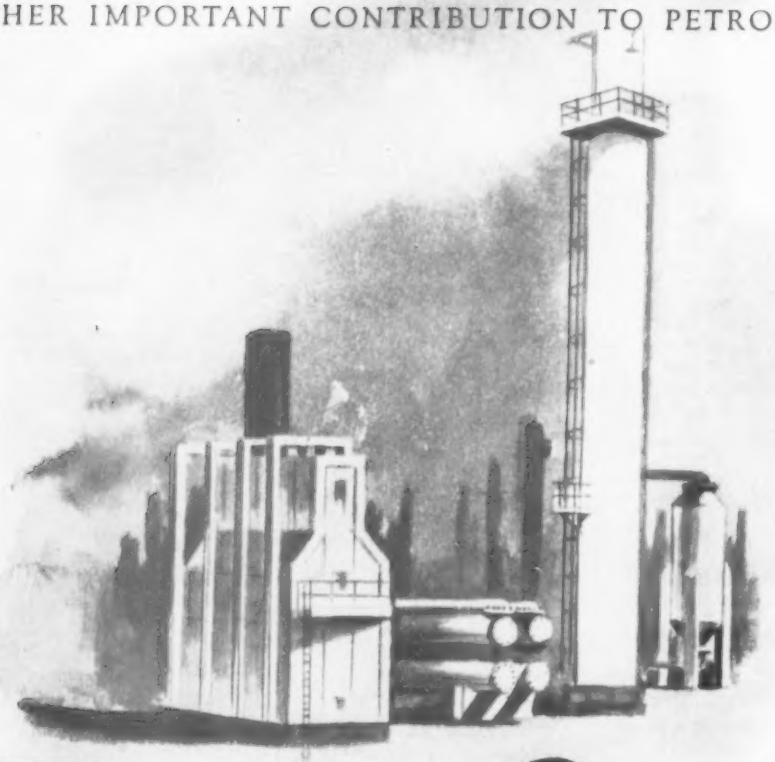
Close inspection should be given to the taps—whether flange or pipe taps are used—to see that no burrs protrude into the line, as this obviously can cause a source of error also.

The manometer . . . The differential gage which measures the drop across the orifice should be inspected to see that the gage lines are tight, that all valves are capable of positive shutoff, and that there are no leaks around the valve stems. An examination of the manometer will indicate that the reading is a direct function of the difference in levels in the manometer chambers.

A comparison of the manometer reading with a suitable water column will indicate whether the calibration of the differential gage is correct, and will also serve as an indication as to flaws in the mechanism—such as might result from stuffing-box binds, dirty mercury, or from an incrustation on the man-

*Author is with American Meter Company, Inc. Paper presented before the Panhandle-Plains Regional Meeting of the Natural Gasoline Associaion of America, November 20, 1953.

ANOTHER IMPORTANT CONTRIBUTION TO PETROLEUM PROGRESS



Unifi

A New Catalytic Refining Process to Purify Petroleum Distillates

Universal Oil Products Company is pleased to announce that the UNIFINING process is now available to the petroleum refining industry, and a refiner may secure the benefits of the combined techniques and patent rights of both Universal Oil Products Company and Union Oil Company of California through a single licensing arrangement.

The process uses a cobalt-molybdenum type catalyst to react hydrogen with petroleum distillates, saturating the olefinic hydrocarbons and removing sulfur, nitrogen, oxygen, and other impurities to the degree desired by the refiner.

Excess hydrogen from a UOP Platformer provides an excellent and economical source of hydrogen for the Unifining unit.

n i n g

Unifining is particularly advantageous for pretreating certain types of feed stocks prior to processing in a UOP Platformer. By using Unifining in combination with a Platforming unit, the refiner will find that engineering advantages accrue which will be reflected in lower costs to him.

UNIVERSAL OIL PRODUCTS COMPANY

General Offices: 30 ALGONQUIN ROAD, DES PLAINES, ILL., U.S.A.

UOP®

Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Investment

ometer walls. With a float located in the low side of the meter, it is possible to calibrate and make any adjustments with the low side cover removed. The single-column water gage is attached to the high side of the manometer and a comparison can be made by a manipulation of the valves in the gage lines.

The low side chambers of the mercury manometers are identical for 20, 50, 100 and 200-in. meters; calibration is a direct function of the diameter of the high side chamber. No change in calibration should result from normal service. Any apparent change in calibration should be investigated as the possible result of friction, incrustation on the manometer walls, or from foreign material in the manometer chambers. The check valves should be cleaned and adjusted so that they will operate freely. New seat disks should be installed where soft-seated check valves are used.

The effect of wear can usually be disregarded since there is only one point of relative motion between the float and the pen arm i.e., the bearing point between the float stem and the float lever. Proper calibration also requires that the pen arm be of the proper length and adjustment of the pen arm so that proper arcing is obtained is a necessity. After the manometer has been cleaned and all maintenance operations have been completed, the manometer should be leveled and the correct amount of clean mercury placed in the manometer.

A recalibration check with a single-column water gage should be made to confirm the accuracy of the device after cleaning and maintenance operations. When the manometer is calibrated and properly adjusted, the readings will check a water column perfectly throughout the range of the instrument. Correct setting of the float stop permits a travel of about ⅛ in. beyond the chart circle corresponding to maximum range. The meter should then be zeroed under pressure. Care should be exercised in manipulating the gage line valves while putting the meter into service or taking it out of service.

Static pressure . . . The bourdon static pressure element used in gas measurement is as important to the flow calculation as is the manometer. Consequently, too much emphasis cannot be given to the care and calibration which this device should receive. Field calibrations are usually made with either an accurate test gage or with a deadweight tester, while shop calibrations are usually made with the latter. When using the deadweight tester, the connections should be arranged so that oil from the tester does not enter the capillary tubing or the helical element, thereby causing false readings.

Pulsation damping . . . All conventional orifice meters can be furnished with a pulsation' dampener or choke. Extreme care should be taken to safeguard against damping the meter too much. In calibrating the meter, it can readily be ascertained whether the meter has been overly damped or not by the response to a given differential imposed on the meter as compared to the water column. Most persons like to see a meter respond to a small change—say 10 per cent linear change in differential pressure—in a matter of a few seconds. However, it has been proved that a meter can be damped more than this and be accurate if the changes in flow rate are not too sudden.

Pulsating flow is one of the conditions which eventually leads us toward damping a meter excessively. While it is true that a meter record can be smoothed out by pinching down on the pulsation dampener, it obviously does not help the measurement in the least. The best practice on pulsating flows is of course to try to locate the meter at a point remote from the pulsations if possible; and if not, by adding capaci-

When you buy STURDYBILT Prefabricated Houses you need never to lose your original investment. Any STURDYBILT House can be moved to your new site, or sold to another company for erecting on its lease.

Check the advantages of STURDYBILT houses, garages, warehouses, tool houses and other buildings before you buy any oil field housing.

■ WRITE FOR INFORMATION

♦ MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

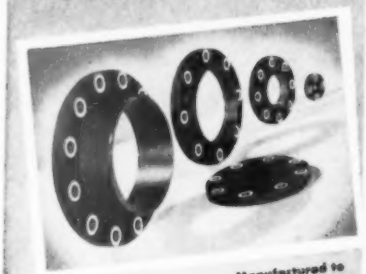
SOUTHERN MILL & MANUFACTURING CO. ♦ TULSA, OKLAHOMA.

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

MILLIONS
IN USE IN ALL BRANCHES OF THE PETROLEUM INDUSTRY

Made to A.P.I. and A.I.S.I. Specifications

HARRISBURG SEAMLESS STEEL PIPE COUPLINGS



Manufactured to A.S.A. Standards

HARRISBURG DROP-FORGED STEEL PIPE FLANGES

Wherever couplings and flanges are used, the *Harrisburg Steel* reputation for consistently reliable products is well known. Oil producers, large and small, have used them for generations . . . depend on them for the maximum of trouble-free service. Next time you order couplings and flanges, we suggest you contact our oil country distributors:

Houston · **Henry H. Paris, Distributor, Inc.**
Los Angeles · **Howard Supply Company**
Tulsa · **W. C. Norris, Manufacturer, Inc. (Couplings)**
Tulsa · **Ardun Supply Company (Flanges)**

Or write the factory for Catalogs and prices

HSC-PP 1/54

101 Years in Pennsylvania's Capital
Harrisburg Steel
CORPORATION HARRISBURG PENNSYLVANIA

1ST

CLEVELAND TRENCHERS

LORAIN
SHOVELS CRANES HOES

CP
AIR TOOLS COMPRESSORS

Tulsa Winch
WINCHES

MC
PUMPS MIXERS

BLAW-KNOX
CLAMSHELL BUCKETS FORMS BINS-BATCHERS

WITH THE MEN THAT RUN 'EM

THE LELAND PACKAGED UNIT

The Leland "Packaged Unit" oil field truck body takes the "Blue-Ribbon" from the men in the field! For FLEXIBILITY WITH SAFETY, consider these important features — Manual locking device in tail roller . . . snatch block toggle in tail board . . . headache rack of heavy tubing . . . side recessed double gin pole pocket setting . . . heavy duty drill pipe gin poles . . . flush mounted body deck plate over rear half of body . . . 2" center matched hardwood flooring . . . winch mounting brackets and body clamping parts . . . clearance lamps and reflectors . . . one or two tool boxes.

Also at Leland the contractor finds the top names in all types of general contractors equipment. These lines, also, maintain their reputations by getting the job out when the chips are down. For "Blue-Ribbon" performance field and management men alike "LOOK TO LELAND."

PARTS AND SERVICE

THEW-LORAIN—Shovels, Cranes, Hoes
CLEVELAND—Trenchers
CHICAGO PNEUMATIC — Air Tools, Electric Tools, Compressors.
TULSA WINCH — Winches

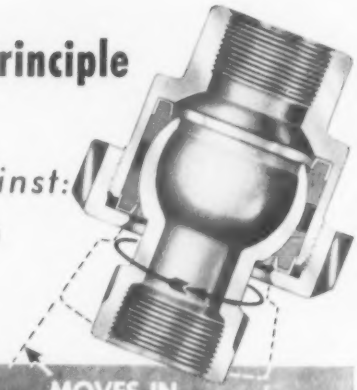
LELAND EQUIPMENT CO.

Oklahoma City • TULSA • Longview, Texas

An ENGINEERING Principle

—protects piping connections against:

1. Expansion—Contraction
2. Vibration—Shock
3. Pump Pressure Surges



BARCO

Flexible BALL JOINTS

1. **VERSATILE.** Barco Ball Joints solve many piping problems where flexible connections are needed to allow for movement, overcome misalignment, and guard piping against vibration, strain or shock.
2. **MAXIMUM FLEXIBILITY.** Up to 40° side flexibility with 360° rotating movement.
3. **MANY STYLES AVAILABLE.** Angle or straight; threaded or flanged connections. For pressures to 7,500 psi; temperatures to 1000° F. 15 different sizes, ¼" to 12".
4. **CHOICE OF MATERIALS.** Built to meet service requirements for steam, oil, gasoline, water, chemicals, and other fluids.
5. **ENGINEERING RECOMMENDATIONS.** Barco will be glad to send you complete information—ASK FOR BULLETIN No. 215.

● *Nothing Moves Like a Ball!* is an old engineering principle but there is nothing old about the use of 3" Barco Ball Joints, as shown in the above picture. This is the newest, most successful, most economical method of protecting connections to modern, high capacity refinery pumps against *Hydraulic Shock Loa ds*, vibration, and expansion.

Equally modern is the use of the two big 6" joints on the main tank piping to protect expensive valves against (1) pipe expansion and contraction, (2) possible earth shock, and (3) tank settling.

Barco Ball Joints have proved to be without equal for this kind of service. They are blow-out-proof, fireproof — simple and rugged. They require no lubrication and minimum maintenance.

We will be glad to send you complete information about Barco Ball Joints and how to use them. *Worldwide Sales and Service.*

BARCO MANUFACTURING CO.
539E Hough Street • Barrington, Illinois

ties or resistances above and below, in that order, to the orifice plate itself. There are times when by the addition of greater capacity—i.e., larger pipe size upstream from the meter run and insertion of an orifice plate somewhere downstream from the meter run—pulsations can be smoothed out very nicely. Pinching one or both of the inlet valves on the gage line manifold should never be practiced, since this can lead to tremendous errors under certain conditions.

Leaks . . . Of course everything possible should be done to eliminate all leaks on either side of the meter when it is first installed. However, leaks do occur, particularly after a meter has been in service and been maintained for some time. If the measurement record seems higher that it should be, it is always good practice to look for slight leaks on the downstream side of the meter body and all the way through the piping to the tap on the downstream side of the orifice plate. If the meter is reading low, the high side should of course be thoroughly checked.

Size of orifice . . . Care should also be taken in sizing the orifice plate to keep the meter in a readable range. Since the orifice meter is notoriously lacking in rangeability, it is always good practice to try to size the orifice in such a way that at minimum normal flows the pen reading will usually be above the lower third of the total range. To state this somewhat differently, on a 100-in. meter it is always good practice to try to size the orifice in such a manner that at minimum flows a reading of 9 in. or better will be registered on the meter. This is due to the fact that the flow varies in proportion to the square root of the differential pressure, and the chart of course becomes difficult to read at the lower portion of its limits.

Friction . . . While the orifice meter is a relatively simple device in which no motion occurs except when there is a change in flow, it is still possible to encounter binds and dead spots. They can best be detected and corrected while running a calibration test on the meter. It is always good practice to approach a definite point on the scale from both directions to see that the meter reproduces the exact reading when the pressure is raised and lowered. When the meter is in over-all calibration—i.e., at zero, midscale, and 100 per cent—and will perform the aforementioned test at several different places on the scale, it may be assumed to be relatively free from any binds or dead spots which might hinder good measurement.

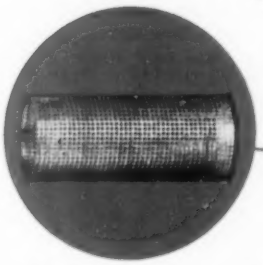
Here's a *Real* STEAM TRAP PACKAGE

WANT FAST HEAT-UP OF OFF-AND-ON PIPE COILS, HEADERS, UNIT HEATERS, ETC.?

Speed heat-up with Armstrong thermic bucket traps. When steam is first turned on, air is pushed out the large thermic vent—fast! As soon as steam reaches the trap a thermic strip closes the vent, then the bucket functions as a regular bucket. Traps with thermic vent buckets discharge air 50 to 100 times faster than other traps.

NEED A CHECK VALVE AHEAD OF TRAP?

Just specify Armstrong with internal check valve. No check valve installation labor or fittings needed. Spring loaded action and vertical position minimize danger of dirt holding valve open. The Armstrong internal check valve is top quality—long lasting.



NEED A STRAINER AHEAD OF TRAP?

Save money with Armstrong built-in strainer traps. They cost less than a separate trap and strainer and save installation time and money. Stainless steel screen lasts a long time.

Get the full facts about all Armstrong traps. Send today for free Catalog J, The Armstrong Steam Trap Book.

ARMSTRONG MACHINE WORKS
868 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

Rate of Evaporation of Various Oils

by W. L. Nelson
Technical Editor

"We would greatly appreciate it if you would forward to us data or refer us as to where data can be obtained on the rate of evaporation of:

1. **Gasoline.**
2. **Premium fuel (diesel).**
3. **Furnace oil.**
4. **In storage tanks aboveground.**
5. **In storage tanks belowground.**
6. **Tanks of various capacities.**
7. **At various temperatures.**
8. **Of various colors.**

"We are primarily interested in steel storage tanks of approximately 200 to 500-gal. capacities as used in farming or the agricultural business."—C.A.R.

Although literally hundreds of articles have been published on the subject of evaporation losses, scarcely any information that applies to specific situations is available, and with respect to average conditions, the literature is even less helpful or may even be misleading. The recent paper, "Evaporation Loss of Petroleum From Storage Tanks," presented before the thirty-second annual meeting of the American Petroleum Institute at Chicago, November 10, 1952, *(The Oil and Gas Journal, November 17, 1952, page 266)* is probably the most comprehensive discussion of the subject of evaporation that is available. Although it outlines completely the variables that are involved, it provides no means of selecting average temperatures for various regions or situations, it does not discuss heavier oils than gasoline or crude oil, and it does not discuss underground storage or variations in ground temperatures.

The reader's question cannot be specifically answered but the relationship between the various variables can be discussed.

Effect of materials . . . Vapor pressure is perhaps the single most important variable. Commercial gasolines have a vapor pressure of 10-12 psia. by the Reid method, kerosine and distillate fuels (furnace or diesel) have scarcely any vapor pressure, and the vapor pressure of lubricants or residual fuel oils is entirely negligible. The relative losses of materials in the vapor pressure range of 3 to 12 psi. R.v.p. by standing and during filling were published on the February 22 and March 1, 1951, issues of this page as a function of temperature. Table 1, shown here, extends these relationships to the heavier (lower-vapor-pressure) oils for the single temperature of 60° F. The table should be used only for a comparison of materials held under the same storage conditions and the same number of fillings. Thus, if the loss from a 10-psi. R.v.p. gasoline tank is 12 per cent per year, the loss from a similar tank of diesel fuel would be only 12 times 0.002 = 0.024 per cent per year.

Underground storage . . . Temperature and daily variations in temperatures are also very important factors in causing evaporation. Inasmuch as underground storage tanks are at lower temperatures and the variation in temperature is almost negligibly small, the losses from underground tanks would be smaller than from surface tanks, due to the lower temperature which would reduce filling losses and especially to the fact that standing losses would be somewhat negligible. The actual evaporation loss would, of course, be greatly affected by the number of times the tank is filled. Finally, the filling loss would be governed to a large extent by the temperature of the oil in the delivery truck or tank rather than the temperature of the underground tank. It can only be stated that the loss from underground tanks would be very small compared with losses from aboveground tanks.

Tank capacity has, at least theoretically, no effect on evaporation losses except, of course, that small tanks may be filled more often than large tanks and under farm conditions may be allowed to become almost empty before they are refilled and the geometric configuration of small tanks might lead to different temperatures in such tanks.

The other factors, color and temperature, have been discussed elsewhere as in the A.P.I. article mentioned above and in Questions on Technology, February 22, 1951, page 202 (Standing Losses); March 1, 1951, page 78 (Filling Losses); June 23, 1952, page 111 (Computation of Losses); and November 2, 1953, page 130 (Colors).

TABLE 1—APPROXIMATE STORAGE TANK LOSSES (60° F.) OF VARIOUS MATERIALS RELATIVE TO LOSS OF 10 PSI. R.V.P. GASOLINES AT 60° F., PER CENT

Material—	R.v.p. at 60° F.	True v.p. at 60° F.	Loss relative to 10-psi. R.v.p. gasoline
Light gasoline	12	6.0 psia.	125
Gasoline	10	4.8 psia.	100
Heavy gasoline	8	3.6 psia.	76
Crude oil	6	4.7 psia.	98
Crude oil	4	3.2 psia.	67
Crude oil	2	1.6 psia.	33
200°-300° solvent		0.9 psia.	19
300°-400° solvent		*0.6 psia.	12
120 flash kerosine		*1.5 mm.	0.6
150 flash distillate or diesel fuel		*0.5 mm.	0.2

*Based on a consideration of the vapor required to cause flash point.

Steam Required for Fuel-Oil Tank

"I have been toying with a problem and I would appreciate it if you would show me the computations required to learn how much steam is required to keep a tank of No. 6 fuel oil at 150° F., also what size of coil to use?" W.A.H.

The information needed to solve such a problem is discussed on pages 519 and 520 of the Third Edition of Petroleum Refinery Engineering, McGraw-Hill Book Co., Inc., N. Y., 1949. Somewhat more complete information is also available in the *Refiner's Notebook issue of October 7, 1944, page 103, of The Oil and Gas Journal.* The sizing of coils for heating (1) gas oil or crude oil, (2) lubricating oils and (3) semisolids (as No. 6 Fuel), is discussed as well as the amount of steam required.

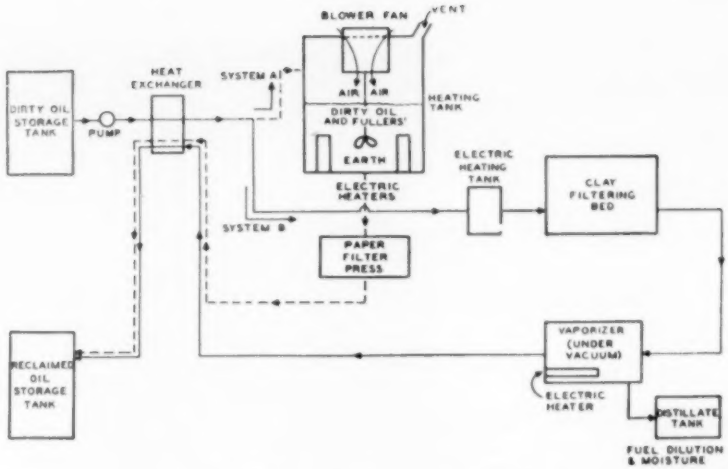


Fig. 1—Steps in normal reclaiming of used oils.

What Price Lube-Oil Reclaiming?

"What is the cost of lube-oil reclaiming and is the oil satisfactory?" G. T. H.

There are so very many ways of conducting lube-oil reclaiming, some complete and others very simple, that costs can range widely. Complete re-refining can result in an oil product that is equal or superior to new lubricating oil whereas the less complete reclaiming operations may result in inferior oils.

Complete re-refining operations (involving settling, vaporization of fuel remnants, acid treating, possibly dewaxing, contacting with adsorbent clay, and introduction of additives) are so expensive that they can seldom be contemplated. Competition is keen because of the very low price of tank-car shipments of new lubricating oil. Neutral oils and bright stocks average about 16 cents per gallon (1954) at the refinery, but with freight the cost may in some regions exceed 30 cents per gallon. Also, the cost of storing large volumes of blending stocks is great.

The conventional standardized reclaiming units produce an oil that is satisfactory for most purposes and the direct cost of reclaiming is only 8-12 cents per gallon. However, if the used oil (feed) must be collected and if depreciation, maintenance, labor, supervision, etc., are charged to the operation, the cost ranges from about 25 cents per gallon for the largest units to as much as 90 cents per gallon for a small unit (see Table 1). Such units produce only one grade of oil, namely, the particular grade (viscosity) that corresponds or can be made from the used oil that is available.

The cost of collecting the oil and the great cost of labor, directs us to the real field of usefulness of lube oil reclaiming, namely, large industrial establishments such as:

Airports.
Air bases.
Bus terminals.
Steel mills.
Dairies.
Transportation companies.
Taxi systems.
Diesel-electric power plants.
Diesel-electric locomotives.
Diesel-powered ships.

In such or similar situations, the cost of collecting oil may be negligible, auxiliaries such as compressed air and water are readily available, little if any storage is necessary for used or reclaimed oil, labor may be incidental to other jobs, and a maintenance staff is already available. Ten million gallons of oil was reclaimed, mainly in such establishments in 1940, about 50 million in 1948, and perhaps 75 million gallons will be reclaimed this year. Standard reclaiming units are entirely automatic except for dumping at regular (1-hour) intervals and they usually involve heating (electrically), exposing to a vacuum to vaporize remnants of gasoline, mixing with acid-treated adsorbent clay, filtration using compressed air for pressure, and manual dumping and refilling with clay. Finally, in large establishments no questions are asked about quality, and little testing is necessary.

In comparison, the operation of a reclaiming plant on filling-station used oil is a difficult proposition. The station attendants sometimes fail to segregate the waxy transmission oils which spoil the pour point or the corrosive gear lubes. The cost of collecting, delivering, and storing the used oil at the plant is large, and a big capacity (400 gal. per day) must be maintained in order to avoid excessive labor costs. Finally, the oil must be thoroughly tested, the purchaser must be convinced of the quality of the reclaimed oil, and a supply of reclaimed oil must be kept in storage.

Some of these costs are summarized in Table 1 for a reclaiming business based upon the use of filling-station (or scattered) used oil. Collection costs are based on the trucking of 8 to 70 bbl. per week of used oil; depreciation of the reclaimer, testing equipment, air compressor, storage tanks, piping system, etc., during a 5-year period; reclaimer operations costs based on 1 kw. per gallon and 0.75-1.0 lb. clay per gallon; and labor at two to four men for trucking, dumping, testing, supervising, but not selling. Fig. 1 from "Oil Purification, Filtration and Reclaiming," Lubrication (The Texas Co.) Vol. 33, No. 1, January 1947, indicates the operations conducted in most standardized reclaiming units.

TABLE 1—APPROXIMATE COSTS OF RECLAIMING USED LUBRICATING OIL IN AN INDEPENDENT PLANT FED FROM FILLING STATIONS

	40 gal. per day used oil 30 gal. finished	400 gal. per day used oil 300 gal. finished
Investment*	$4,000-$5,000	$12,000-$14,000
Operation:†		
Cost of used oil	0— 5.0	0— 5.0
Collecting oil	2.0— 4.0	0.7— 2.0
Depreciation	8.0—22.0	2.5— 6.0
Reclaimer operation	8.0—13.0	7.0—12.0
Maintenance and repair	0.8— 2.2	0.4— 1.0
Supervision and labor	45.0—60.0	10.0—12.0
Total	†70-90 ct. per gal.	†27-33 ct. per gal.

*Not including space or rental. †Not including containers, use of additives, sales, taxes or profit.

ENARDO QUALITY

Why sacrifice quality for price? When you buy Enardo products, you are buying quality, not cut-price products. You are buying first-rate equipment backed by manufacturers with years of experience and leadership in their chosen field.

Our products are designed and built to give you the best possible service with the least mainte-

ENARDO manufacturing company

BOX 1647 • TULSA, OKLAHOMA

What to Do About Lost Circulation—3

by J. M. Bugbee

A RECENT well in Denton field, New Mexico, fought a loss zone occuring near 10,000 ft. for 53 days with no success. A great number of plugs of many types, utilizing a total of 9,000 sacks of cement and large quantities of other materials, were placed without effect. The fluid level stayed at 1,000 to 1,400 ft. throughout. Blind drilling was then resorted to; and, after drilling a few hundred feet, 7-in. casing was cemented.

In a more recent well in Denton, a complete loss occurred at 9,750 ft. which was cured with five gel-cement and oil-bentonite plugs after the pumping away of 20 tons of bulk fiber and flake material had no effect. Drilling continued and another loss zone was encountered at 10,494 ft. Twenty-one varied plugs were placed and some drilling was done to 10,550 ft., but circulation was never regained.

Blind drilling with water was then commenced, and within 12 hours partial returns were secured. Drilling continued to 11,300 ft. with seepage losses of from 10 to 20 bbl. per hour, which the circulating of fiber and flake material did not decrease.

A combination oil-bentonite and gel-cement plug was then squeezed into the loss zone, whereas previous plugs had gone away under vacuum. The plug was then drilled out and drilling continued to 12,100 ft. with full returns.

It seems clear that the cuttings rising from the bit and carried into the loss zone bridged and closed the loss zone nearly completely. This occurrence raises the question whether a more practical procedure than long-continued blind drilling would be to drill blind through the zone (in the forgoing example to, say, 10,550 ft.) and then displace through open-ended drill pipe in a thick gel-mud vehicle a quantity of a selected particle-size range of pea gravel, fragmented plastic, and walnut shells.

Of course a great many such plugs have been used, but their record of success is not great and two suggestions are therefore made: (1) that they be displaced from below the loss zone so that velocities are decreased in traveling up the annulus and out into the loss zone; and (2) that larger quantities of bridging particles contained in the larger amounts of mud be used than in older treatments.

A conclusion as to change of method can be drawn from the foregoing well history: (1) Soft plugs, large quantities of bulk fiber material had no success; and, as this is true generally in this field, this plug should not be tried. (2) Hard plugs, five oil-bentonite and gel-cement plugs successfully sealed the zone at 9,750 ft. Therefore, a reasonable number of such plugs should be used as a first effort. (3) If these plugs are not successful, blind drilling should be tried. It would seem that engineered, bridging-particle plugs should then be tried after only a short interval of blind drilling.

Pretreatment . . . There are reports of tests in shallow simulated wells indicating that pretreatment, the addition to the circulating system in advance of loss of quantities of bridging materials, permits the imposition of considerably higher pressures on the formation before a breakdown or fracture occurs. This appears to be a dubious procedure with both low-solids and high solids muds.

Circulating lost-circulation materials requires that the mud bypass the shale screen. With the low-solids, light-weight mud of the interior United States, bypassing the screen permits quick buildup of solids to increase weight and cannot, therefore, be tolerated. Any increased mud weight will contribute to losses.

With high-solids muds, the addition of lost-circulation materials will increase pressure against the formation because of thickened mud cake, increased viscosity gels, and increased balling techniques. Fine wood fiber or fine mica in concentrations of 1 to 5 lb. per barrel of mud are recommended for pretreatment because they will pass through shale screens. It is difficult, however, to believe that such fine materials at such low concentrations can have any beneficial effects.

More recent work on multiple pressure fracturing shows that an induced fracture may often be readily sealed by the displacement into it of a batch of mud thickened with bridging particles. Thus the use of bridging-particle plugs provides a way of "eating the cake and having it too." The circulation of heavy concentrations of lost-circulation material, with its attendant bad effects, can be omitted; and, if a fracture is induced, it can be remedied by the spotting of a batch of loaded mud.

Proper use . . . From the preceding two selections the suggestion is plain that a completely new evaluation should be made by the drilling industry of the use of these materials for combating lost circulation. For example, the citing of successful applications of these materials in wells which were drilled without any control of the drilling practices which cause large surge pressures or were drilled with muds having a density to give, for example, 1,250 psi. overbalance on the loss zone, would seem to be purely defensive.

What is needed is to collect new experience with these materials in wells using the minimum proper mud weight and controlled drilling practices. It seems when the facts are developed that the use of these materials will be much restricted as compared with the present.

Author is with Shell Oil Co., Houston. Paper presented at A. P. I. Southwestern District meeting, Fort Worth.

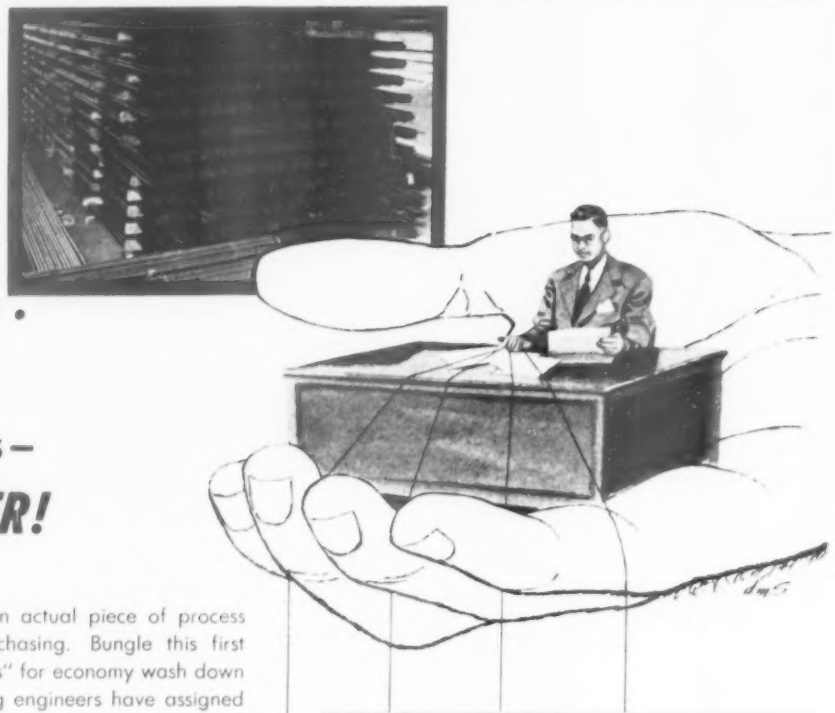
"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

▲ SYNOPSIS OF AD NO. 4: To provide the company's customers with a complete service in the design and construction of heat transfer equipment, Western Supply Company offers an experienced staff of thermal and mechanical engineers. This group works with the client's own engineering department to speed delivery and provide for maximum economy in labor and materials. A complete heat exchanger engineering service . . . at no additional cost to the customer.

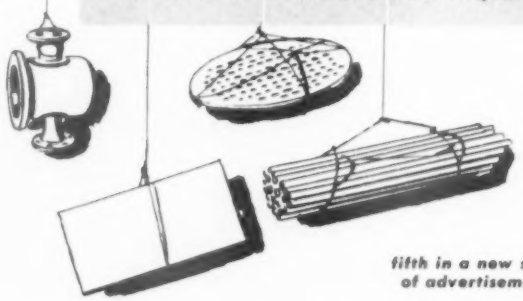
WESTERN'S Selective PURCHASING . . .

Builds better Heat Exchangers — *FASTER!*



Changing a set of blueprints to an actual piece of process equipment always starts with purchasing. Bungle this first step and carefully laid "paper plans" for economy wash down the drain. Once the Western rating engineers have assigned a work order number and the drafting section has compiled the preliminary bill of materials, experienced material clerks go to work carefully checking the list against Western's warehouse stocks. In the Tulsa warehouse (see photo above) large inventories of plate stock, tube-sheets, channels and channel covers, steel and Admiralty tubes are maintained. At Western's **purchasing** department SERVICE calls the play. Special materials have, on occasion, been ordered **in advance** of the client's own equipment purchase order . . . a risk taken by Western so that equipment could be moved quickly through fabricating when the green light was given. Close personal contact is maintained with local and out-of-state supply sources . . . a working arrangement that brings special materials to the modern Western heat exchanger plant via every possible means of transportation.

The process engineers at a large chemical plant recently discovered the beginnings of deterioration in Hexamine solution due to overheating. On Feb. 10th the company called Western . . . by Feb. 12th a 16", 10' fixed tube sheet exchanger had been designed . . . by Feb. 13th shell and tube side stainless steel parts had been located in the warehouse of a Tulsa metal company . . . EXCHANGER SHIPPED BY SPECIAL TRUCK FEBRUARY 25th — 15 DAYS FOLLOWING INITIAL INQUIRY.



WESTERN
HEAT EXCHANGERS

WESTERN SUPPLY CO.

P. O. BOX 1888 • TULSA, OKLAHOMA

fifth in a new series of advertisements

Wherever there is Oil

you'll find MID★CONTINENT Service & Supply

In the jungles of Venezuela; in the deserts of the Middle East; on the frozen planes of Canada; in the off shore waters of the Gulf . . . Wherever the spinning steel bit probes for the earth's hidden "Black Gold" there is a strategically located Mid-Continent source of supply to serve you "Around the Clock, Around the World."

LISTEN TO "FACTS FORUM" SPONSORED BY MID-CONTINENT

MID-CONTINENT Supply Company

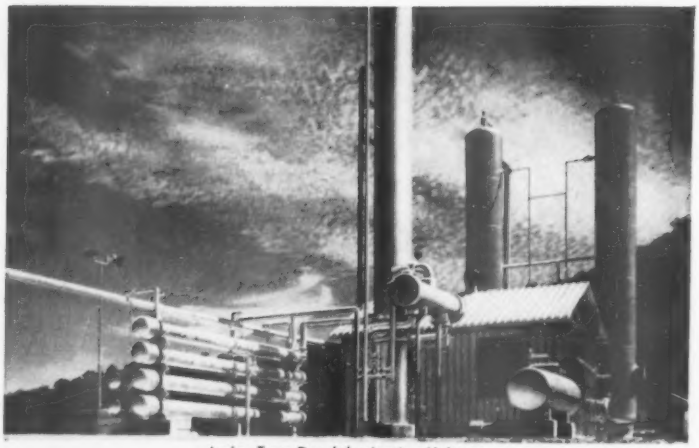
MID-CONTINENT BLDG. FORT WORTH, TEXAS

TREAT IT RIGHT!

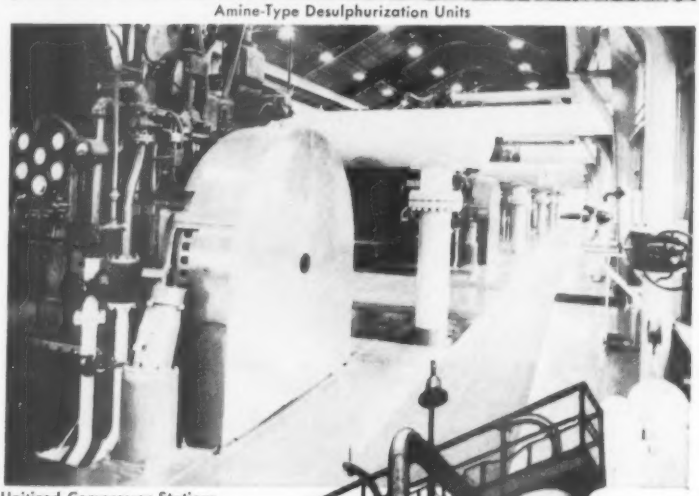
Naturally, you get more production . . . more profit . . . from gas treating facilities of modern, compact, efficient design. Pritchard has proved its exceptional ability — earned and learned through long experience — to engineer and construct such dependable installations for the gas industry. If you want to treat it right, let Pritchard know-how solve your gas treating problems.

Industry's Partner for Progress

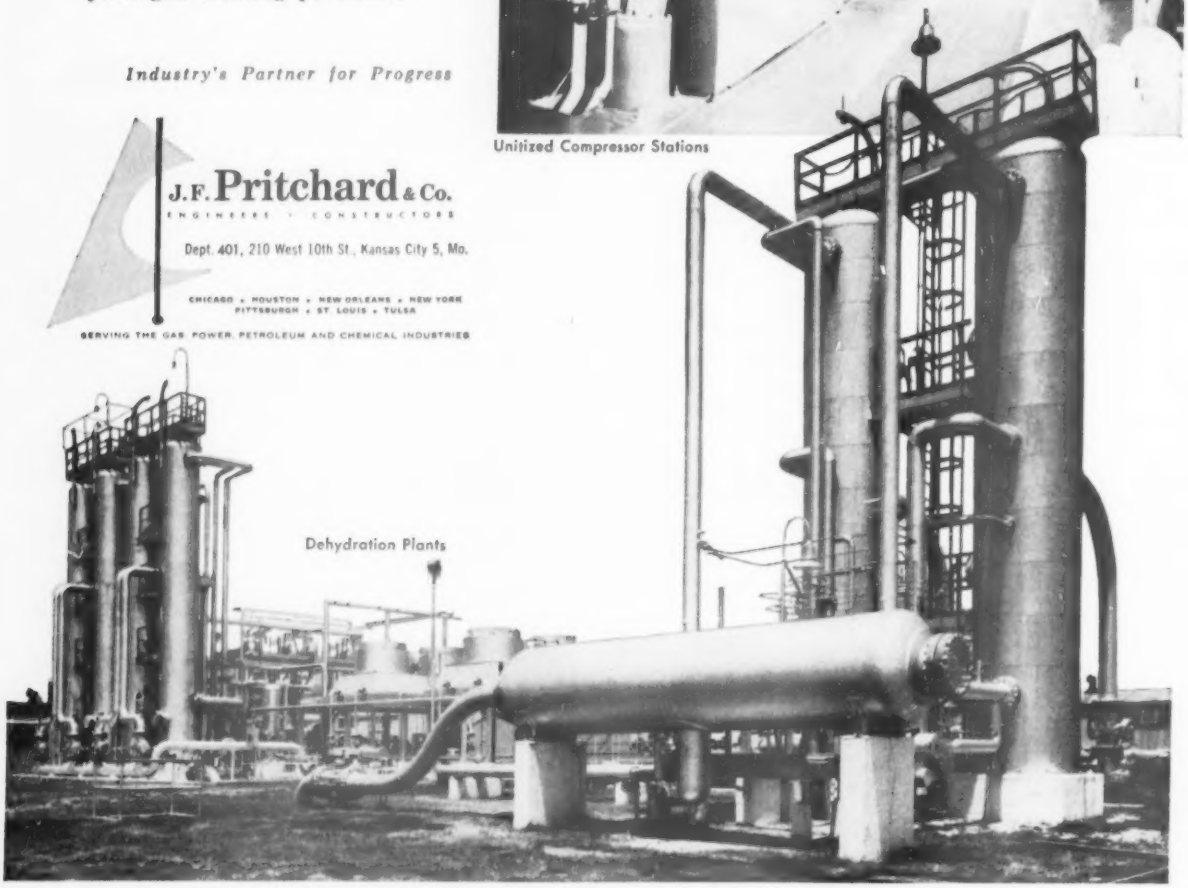
J. F. Pritchard & Co.
ENGINEERS · CONSTRUCTORS
Dept. 401, 210 West 10th St., Kansas City 5, Mo.
CHICAGO • HOUSTON • NEW ORLEANS • NEW YORK
PITTSBURGH • ST. LOUIS • TULSA
SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES



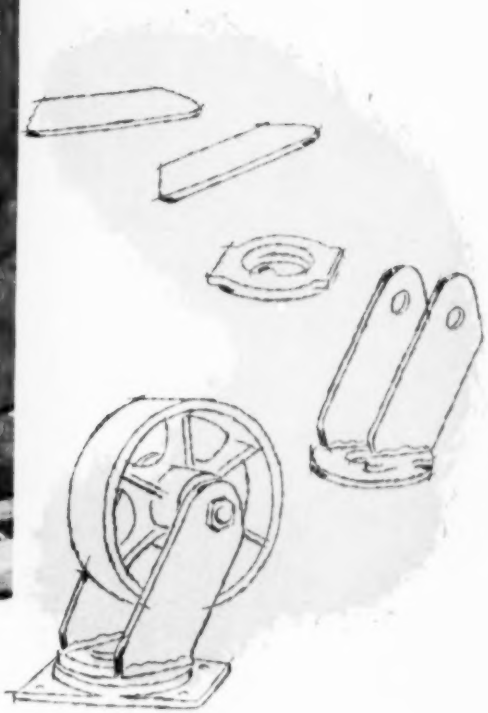
Amine-Type Desulphurization Units



Unitized Compressor Stations



Dehydration Plants



SIGMA WELDING BOOSTS STEEL FABRICATION 100%

A manufacturer of steel truck casters, has doubled his production from 400 to 800 units a day— by changing to sigma welding.

Average welding speed is 120 in. per minute—Once clamped, the parts are welded in less than ½ minute.

Used as welded—Free from spatter and flux entrapment, the need for finishing is eliminated.

Cut costs—Fewer production steps have made possible labor savings up to ½ the former costs.

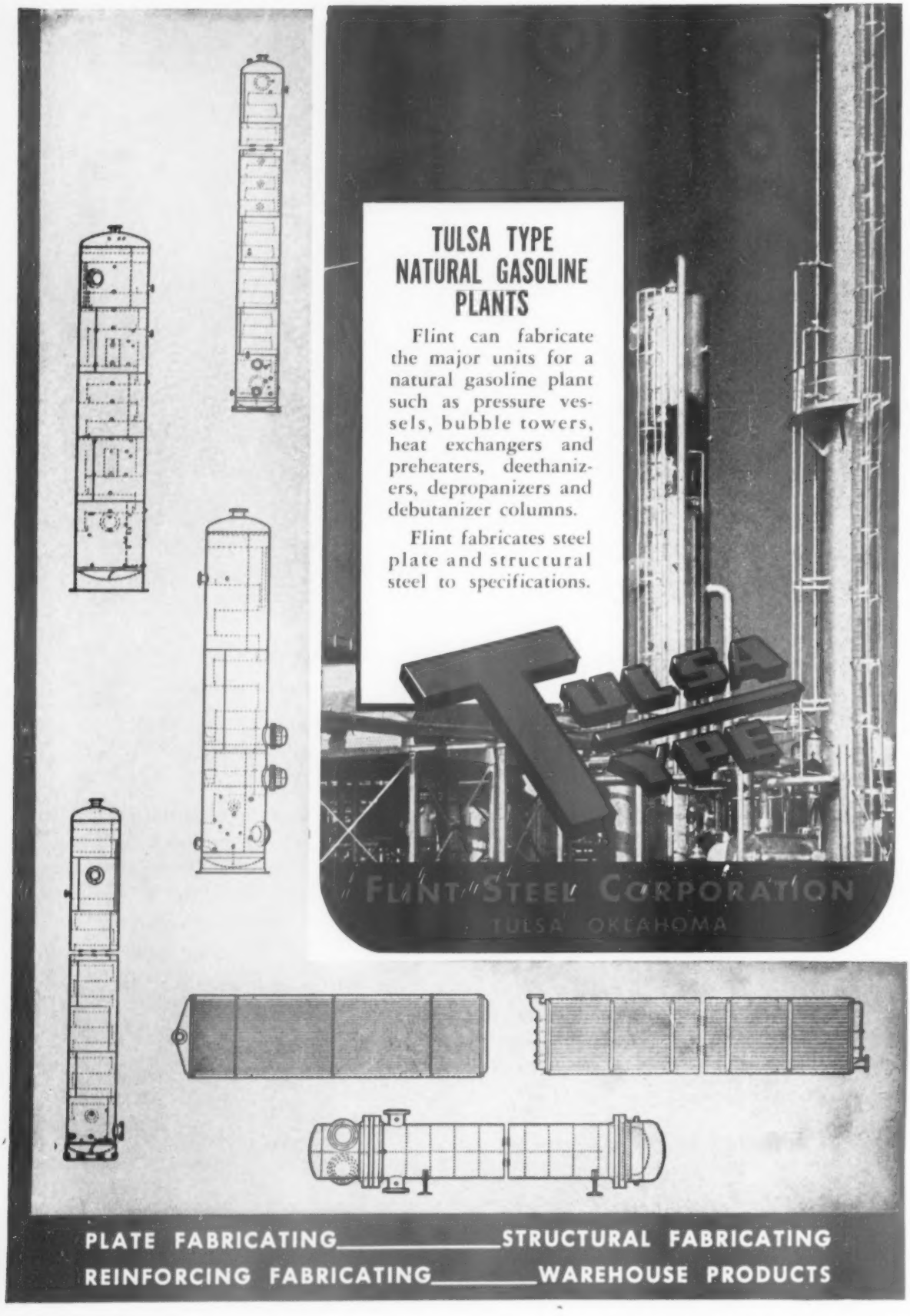
Sigma welding is just one of the welding processes developed by LINDE's research and years of experience. HELIARC, sigma, and UNIONMELT welding form a top notch fabricating team which is now setting a new peak in industrial production. For small shops or huge production lines, from carbon steel to complex alloys and non-ferrous metals—there is a LINDE electric welding process to do the job efficiently and economically. Your local Linde representative will help you determine the best welding process for your job. Call him today for more information.

Visit us at Booths 70-77 Welding Show Memorial Aud. Buffalo May 5-7

Linde
TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited

"Heliarc," "Unionmelt" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.


TULSA TYPE
NATURAL GASOLINE PLANTS
Flint can fabricate the major units for a natural gasoline plant such as pressure vessels, bubble towers, heat exchangers and preheaters, deethanizers, depropanizers and debutanizer columns.
Flint fabricates steel plate and structural steel to specifications.
TULSA TYPE
FLINT STEEL CORPORATION
TULSA OKLAHOMA
PLATE FABRICATING
STRUCTURAL FABRICATING
REINFORCING FABRICATING
WAREHOUSE PRODUCTS

Why these Koppers Piston Rings

give extra service

IT'S the materials used and the methods of manufacture that make for long piston ring service.

Koppers, with over 35 years of engineering and foundry experience, is highly qualified to combine the best of both metal and method. This experience assures you maximum service and satisfaction when you specify Koppers American Hammered Piston Rings.

Koppers engineering and research staff (which gave industry piston ring improvements such as K-Spun and Porous Chrome*) are also fully experienced in analyzing and solving problems. Koppers engineering service is ideally equipped to make recommendations for both original and replacement installations.

Similar leadership is evident in Koppers production facilities and manufacturing *"Know-how."* A large foundry equipped for both static and centrifugal castings, an up-to-date heat-treating plant, modern machine shops, an efficient testing laboratory and a complete piston ring research laboratory are Koppers physical assets. Its skilled manpower and production experts, with their widespread knowledge of the latest production techniques and practical experience in making industrial piston rings, make the products of engineering skill and manufacturing facilities an actuality . . . Koppers American Hammered Industrial Piston Rings.

American industry . . . aircraft, marine, commercial engine, railroad, petroleum, chemical . . . all benefit from this happy union. It gives them piston rings, made better to serve industry better. For help with your piston or sealing ring problems, consult Koppers first. Never any obligation. Write to: THE KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1554 Hamburg Street, Baltimore 3, Maryland.

*Van der Horst Process

KOPPERS ®

AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., BALTIMORE 3, MD.
This Koppers Division also supplies industry with Fast's Couplings, Koppers Electrostatic Precipitators, Aeromaster Fans, Gas Apparatus.
Engineered Products Sold with Service

There's more to instrumentation than instruments

Instruments can do wonders, if they're given the chance. But some one has to put them to work in the most effective way. And that's where Honeywell Application Engineering steps in.

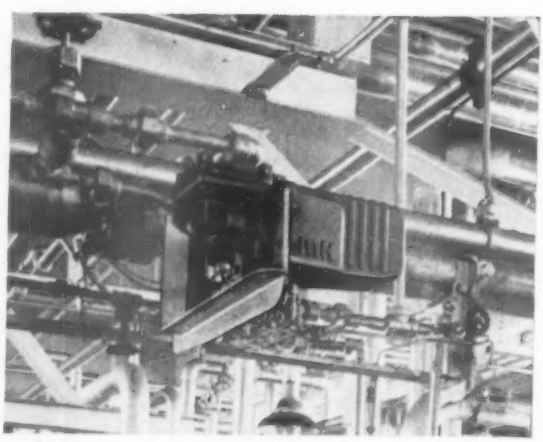
This service is one of the most important plus values you get in Honeywell instrumentation. It's a teamwork job. And every member of the team is an expert in his own field. Engineering begins right in your own plant, where a Honeywell field man digs out the vital facts about your process. He sits down with your engineers, production men and instrument technicians . . . and finds out everything he needs to know about what needs to be measured or controlled, to what accuracy, and under what conditions.

Then the problem goes to Honeywell's Application Engineering staff. Here's where you'll find groups of instrumentation specialists for every major industry. One group, for example, is devoted to the control problems of the metal-working industry. Another handles ceramic applications . . . another chemical . . . until together they cover the whole gamut of modern processes. These men know their specific field from years of first-hand experience. They're thoroughly familiar with the techniques of processing and the ways that instrumentation should be applied.

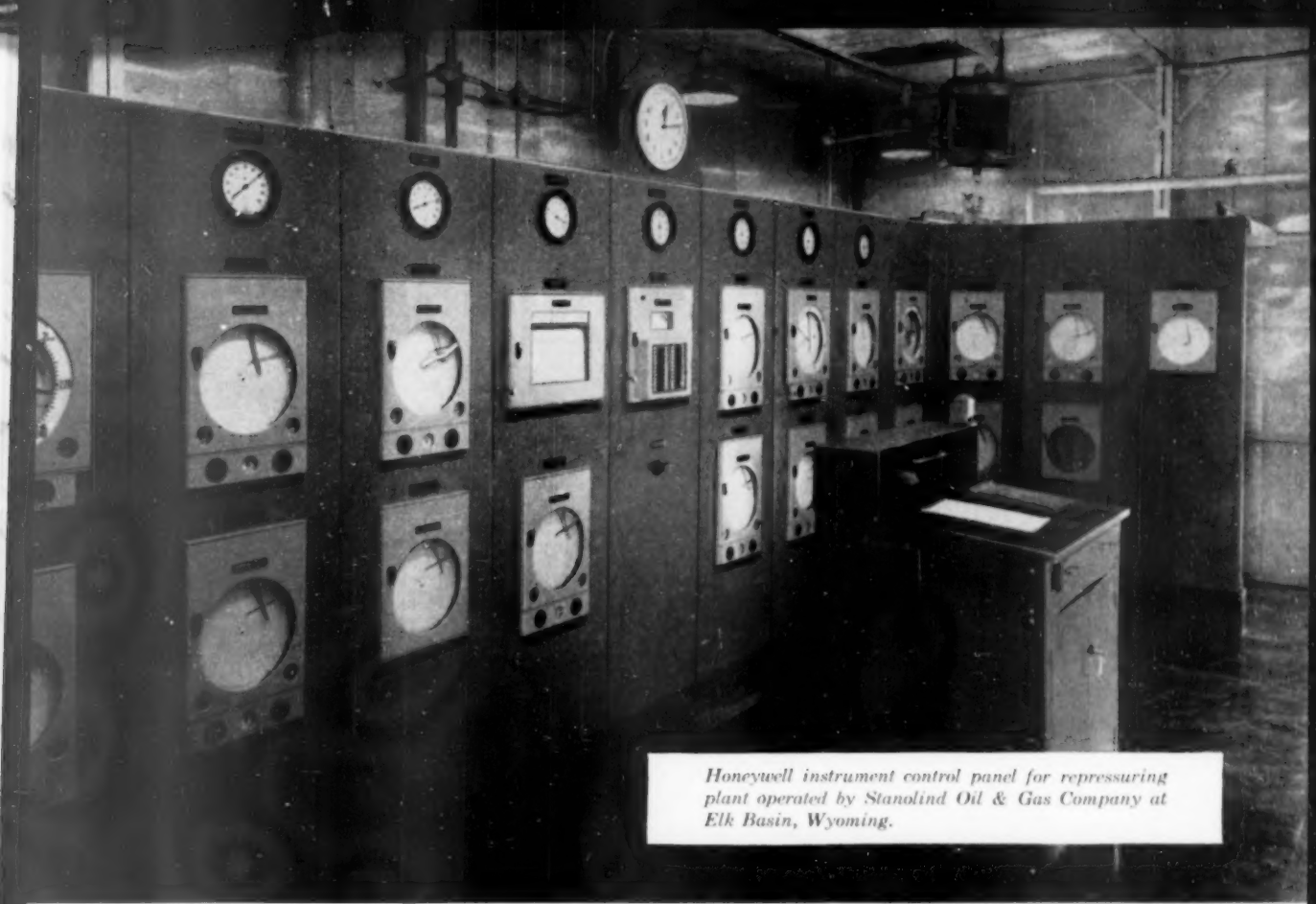
Honeywell Application Engineers develop detailed recommendations for the complete installation. They determine the most effective instruments, primary elements, types of control and valves for every phase of measurement and control. They add switches, signals, interlocks and other accessories which their experience indicates are needed in the interest of safety and convenience. Then they combine all components into a complete system—whether it involves a single instrument or a whole panel—that is designed for peak production efficiency, simple maintenance, and greatest convenience to operators.

This service saves time by doing engineering work that would tie up your own staff for many hours. And it pays off in assuring the excellent performance of which Honeywell instruments are capable.

Complete Honeywell instrumentation *covers every need*



Differential Converter mounted on pipe transmits flow data to a remote recorder on the central control panel.



Honeywell instrument control panel for repressuring plant operated by Stanolind Oil & Gas Company at Elk Basin, Wyoming.

of field processing plants

PLANNING a field processing plant? You don't need to "shop around" for instrumentation for the specialized applications of this kind of unit . . . because the broad line of Honeywell instruments encompasses practically every measuring and controlling assignment. Of particular interest to gasoline plants are:

ElectroniK indicators, recorders and controllers . . . the standard of precision and dependability, these instruments can measure dozens of different variables. The selection includes circular chart and strip chart models, and the Precision Indicator for rapid checking of up to 48 separate temperature points.

Brown Thermometers and Pressure Gages . . . available in practically unlimited choice of ranges and with various forms of pneumatic control.

Flow Meters . . . evenly graduated type for accounting and square root scale type for control applications. Electronic integrator gives fast, accurate flow totalizing. Choice of electric and mechanical meter bodies.

Differential Converter . . . a rugged but sensitive pneumatic balance transmitter for remote measurements of flow, and differential pressure.

Working with these instruments is a full selection of primary elements, control valves and accessories . . . from which Honeywell specialists design custom-fitted systems for individual process requirements. And behind these products stands a nationwide service organization that is always ready to help you, wherever and whenever you need instrument service.

Your nearby Honeywell sales engineer will be glad to discuss your own process control application . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA: Write for Composite Catalog No. 5000.**

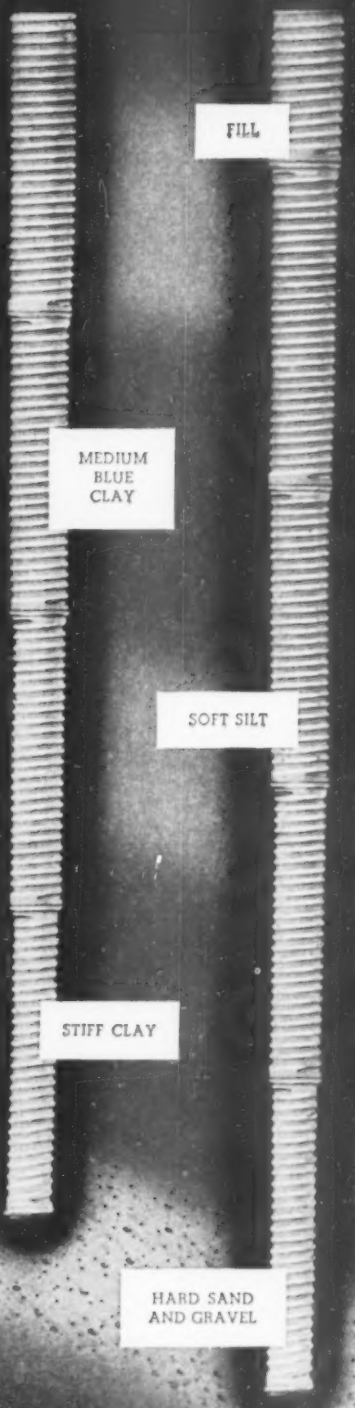
MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Number three of a series . . . . ADVANTAGES OF RAYMOND CONCRETE PILES

uniform bearing capacity

THE COMPLETE FLEXIBILITY of Raymond Concrete Piles as to length permits all piles to be driven to a uniform resistance regardless of variations in depths of bearing soils. Raymond Piles are available in an endless variety of lengths through combining step-taper sections of different lengths or joining step-taper sections with pipe or wood lower sections. Because the piles are cast-in-place, time is saved (and cost reduced) by eliminating the driving of test piles to predetermine lengths, as well as eliminating the delay due to casting and curing of precast piles.

RAYMOND STEP-TAPER PILES, AVAILABLE IN SUITABLE LENGTHS, ARE DRIVEN TO UNIFORM RESISTANCE AND BEARING CAPACITY REGARDLESS OF SOIL CONDITIONS.



RAYMOND CONCRETE PILE CO.

140 CEDAR STREET • NEW YORK 6, N. Y.

Branch Offices in Principal Cities of the United States, Central and South America

RAYMOND'S DOMESTIC SERVICES

Soil Investigations • Foundation Construction
Harbor and Waterfront Improvements
Prestressed Concrete Construction
Cement-mortar Lining of Water, Oil and Gas Pipelines In Place

RAYMOND'S SERVICES ABROAD

In addition to the above, all types of General Construction.

AROUND THE WORLD FOUNDED 1902

LIMITORQUE®

...the most widely used
AUTOMATIC VALVE OPERATOR
in the world

Thousands are operating day and night, —from the Oil Fields of Saudi Arabia to the Oil Fields of Texas—In refineries, too. In the worlds largest Central Stations and Private Power Plants.—In Water Works and Sewage Plants . . . In Chemical and Process Plants,—and even aboard many prominent ships.

There are *many* and *good reasons* why LimiTorque is by far the outstanding Valve Operator, . . . Write for Catalog and further data and you'll be convinced.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

increase production and reduce operating costs

with

PARKERSBURG

Air Balanced

PUMPERS

Parkersburg 100-G456D-30-N11
Air Balanced Pumper on a
deep well in Mississippi.

Parkersburg 64-G160-20-N11
Air Balanced Pumper with Time Compensator.

Parkersburg 74-G628D-25-N11
Air Balanced Pumper in California.

It is mechanically impossible to build a conventional pumper capable of matching the performance of a Parkersburg Air-Balanced Pumper on wells below 6,000 ft. where rod loads are a problem. Time after time, field tests against comparable conventional pumpers have proved that Parkersburg Air-Balanced Pumpers:

1. Increase production by 10 percent or more under same operating conditions.
2. Reduce wear and tear on rods and eliminate breakage.
3. Reduce beam loads and engine maintenance and permit use of a smaller engine to achieve same results.
4. Show substantial savings on operating costs.
5. Cost no more installed.

When you are ready to talk pumpers let us tell you more about air-balanced units . . . and why Parkersburg's are by far the best buy on the market.

PESA

S405

PARKERSBURG
OIL FIELD EQUIPMENT

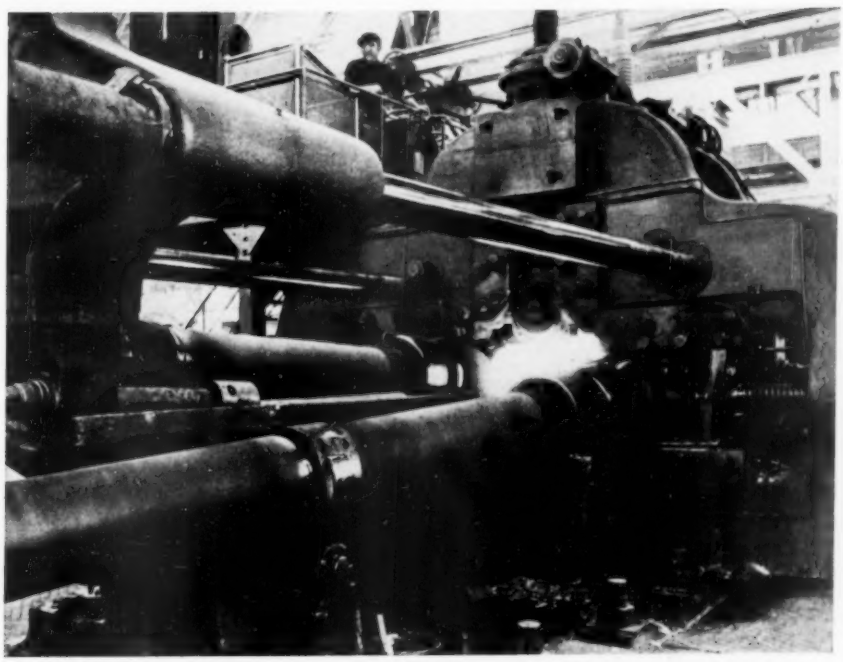
The Parkersburg Rig & Reel Co., Parkersburg, West Virginia
Division of Parkersburg-Aetna Corporation

PUMPERS — Air Balanced • Chain Driven • Gear Driven

Now

The Better to Serve Your Needs
DALMINE STEEL TUBING

DALMINE, S. P. A.
MILANO, ITALY
SEAMLESS PRODUCTS
CARBON AND ALLOY



Piercing Mill in operation at Dalmine Plant, Milan, Italy

CASING TUBING LINE PIPE

Dalmine is now producing P-105 and P-110 pressure casing and tubing for all deep well requirements. Dalmine can provide all tubular products, including tubes for distilling, cracking, refining, hydrogenation, synthesis and processing. Made from carbon steel, chrome-molybdenum, stainless and other alloys.

Dalmine produces a complete range of Seamless Steel Pipe — up to 32½ inches O.D. in carbon and alloy grades, serving all of the tubular products needs of the oil, gas and refinery industries.

Dalmine also offers hot rolled and cold drawn tubing made in accordance with all A.S.T.M. specifications.

Stocks maintained on Pacific and Gulf Coasts.

GENERAL AGENTS IN THE U.S.A.

CHARLES A. KOONS, INC.

620 FIFTH AVENUE
ROCKEFELLER CENTER
NEW YORK 20, N. Y.

PLaza 7-4700

Here's another reason why the 'Specs' call for "WELDOLETS"

Extra strong WeldOlets, butt-welding, utilized to make fully reinforced branch connections in Gas Measurement Headers to operate at 1000 psi.

LET'S COMPARE THE PLUS FEATURES OF WELDOLETS AGAINST REINFORCING RINGS OR PADS

1. The WeldOlet is a Welding Fitting rather than a hand-made reinforcement of a hand-made joint. It is both a mechanical and a pressure member.

2. The self-aligning, shaped and beveled WeldOlet is equally adaptable for shop or field fabrication. Its employment eliminates the need for additional reinforcement.
3. Production economy is realized by employment of WeldOlet construction which speeds up installation time in both shop and field fabrication. Only two welds are required to install WeldOlets.
4. The WeldOlet type of construction inherently provides sufficient reinforcement in accordance with Code requirements to meet or surpass the maximum services of whatever weight pipe is used. To facilitate determination of where it is necessary to reinforce or to use a WeldOlet, the new Bonney catalog W-3 features time-saving data on this subject.
5. Dimensional advantages of WeldOlets allow closer manifolding and cross combinations and provide improved flow conditions.

1. Precious pipe is wasted in making reinforcing rings or pads.

2. Reinforcing rings can be cumbersome to handle and clumsy to fit in both shop and field fabrication.
3. Excessive welding is necessary to complete branch reinforcing requirements according to Code provisions when rings or pads are used. Three separate welds are required. This slows down piece production time in both shop and field fabrication.
4. Lengthy calculations are necessary to determine the amount of reinforcing required when designing for ring or pad reinforcement.

The Bonney Catalog No. W-3 will show you why WeldOlet Welding Fittings offer the quickest, safest and most economical method of establishing and maintaining 100% pipe strength at branch connections in accordance with Code provisions. Write for your free copy.

CANADIAN REPRESENTATIVE
Sterling Steel Co., Ltd.
267 Davenport Road
Toronto 1, Canada

EXPORT DISTRIBUTOR
National Supply Co. Export Div.
600 Fifth Ave., New York 20, N.Y.

WELDING FITTINGS DIVISION

BONNEY FORGE & TOOL WORKS

366 GREEN STREET, ALLENTOWN, PENNSYLVANIA

"WORLD'S LARGEST TRUCK"

VICKERS® HYDRAULICS

Dart Model 60 Truck is shown carrying full 75-ton payload.

This Dart behemoth with a gross vehicle weight of 240,000 lb is said to be the largest truck in the world. It has two engines totaling 700 horsepower. Everything about it is on a colossal scale.

A new hydraulic circuit was developed by Vickers expressly for Model 60. The driver steers this truck with no more effort than he would a passenger car as the steering gear merely actuates the valve that controls the flow of oil to the steering cylinders. Twin cylinders provide 50,000 lb steering force (at 1000 psi oil pressure) for the dual front wheels.

Dart is thoroughly familiar with the many advantages of Vickers Hydraulic Power Steering having used it since 1938.

Vickers hydraulic equipment is available for all types and sizes of mobile equipment. Ask for new Catalog M-5101.

Vickers hydraulic power dumps the load; twin hoists are rated at 130,000 lb push at 1000 psi oil pressure.

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1448 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA (Metropolitan) PITTSBURGH • ROCHESTER • ROCKFORD • SEATTLE TULSA • WASHINGTON • WORCESTER

REPRESENTATIVE STANDARD VICKERS UNITS USED ON DART MODEL 60

6526

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

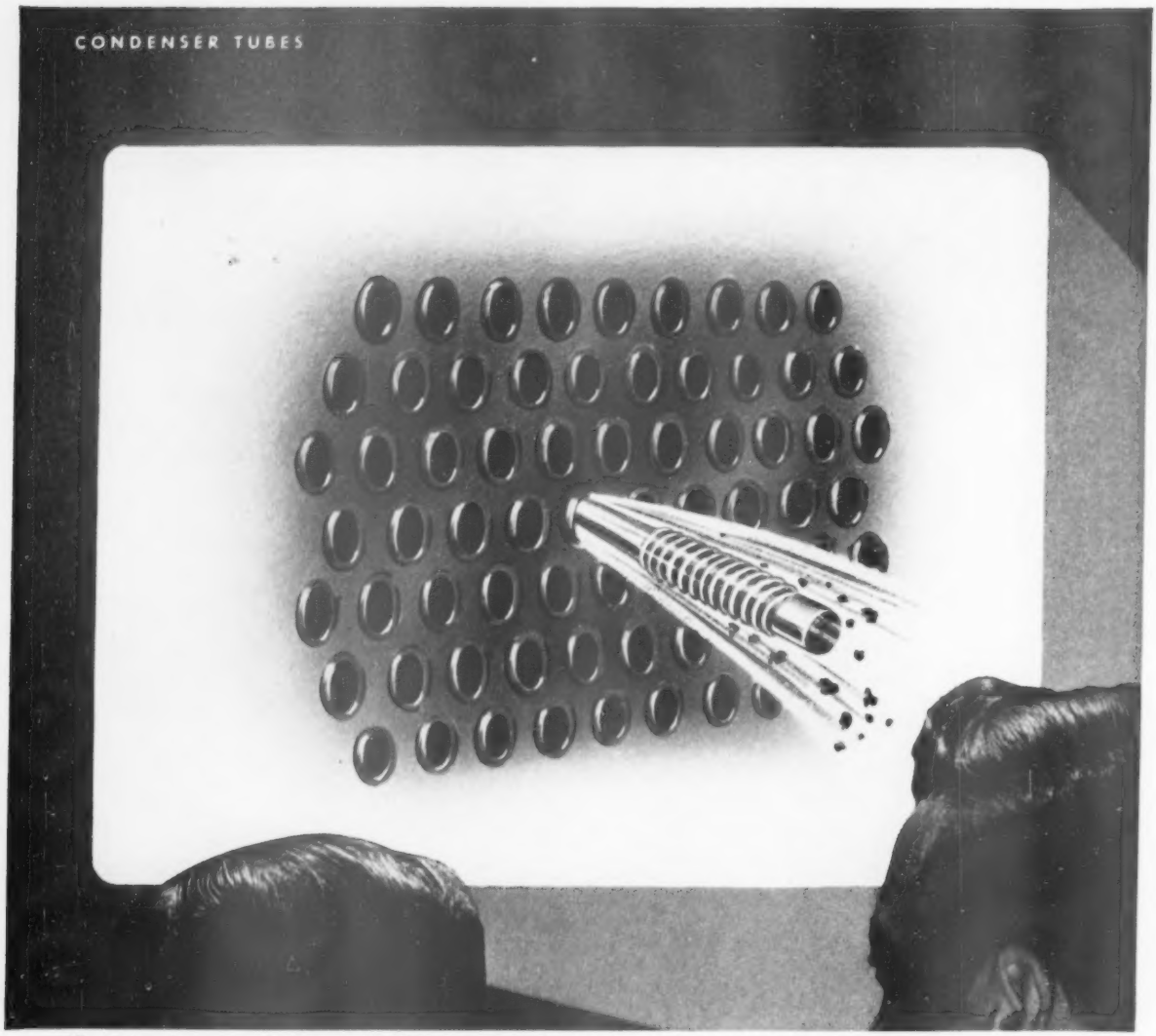


Illustration shows how short bristle brushes—shot through tubes by a high-pressure water stream—remove loose deposits.

COOLING WATER: how its composition affects life of condenser tubes

You can't always pick your plant site where water is noncorrosive. Economics may not permit it. If your plant is located inland, cooling waters generally will be relatively noncorrosive. Tide water plants, however, will have corrosion problems, particularly if the sea water is polluted with industrial or domestic wastes. This is especially true if the organic matter in the sewage is able to ferment under anaerobic conditions. Then sulfides are likely to form. In an enclosed harbor or in a dead-end channel, water may be more or less stagnant. There it is particularly subject to infestation by anaerobic bacteria.

Frequent cleaning of tubes will remove slimes containing bacteria. At the same time it will remove sulfide scales and increase tube life. You can also remove slimes by chlorinating polluted water frequently. This may aid in breaking down unwanted sulfide films on the inner walls of the condenser tubes.

In some cases you can dredge the channel bottom near the water intake to remove accumulations of decaying vegetable matter. This will help to maintain longer tube life.

Cooling water is only one factor affecting tube life. Publication B-2 "Anaconda Tubes and Plates for Condensers and Heat Exchangers," discusses *all* the important operational factors, and gives much other useful information. And, of course, our Technical Department stands ready to assist you in the selection of tube alloys from our extensive line. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 54104

ANACONDA®

Tubes and Plates for Condensers and Heat Exchangers

Arsenical Admiralty-439; Ambraloy-927; Cupro Nickel, 30%-702, and other copper alloys.*
*U. S. Patent No. 2,003,685 (Orig.)

Your TIME SAVER

A SERVICE OF **THE OIL AND GAS JOURNAL**
FOR THE CONVENIENCE OF OUR READERS..

as you **READ** through the pages of

and you **SEE**

PRODUCTS ADVERTISED

on which **YOU** WOULD LIKE MORE **INFORMATION**

use one of these cards

DROP IT IN OUTGOING MAIL
*NO POSTAGE REQUIRED

Mark here FOR MORE INFORMATION ON ADVERTISED PRODUCTS

Your inquiry will be forwarded to the supplier within 48 hours (or less) from the time we receive it.

To The Oil and Gas Journal:
I would like to receive details on products advertised in your issue of April 26, 1954

Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	

PLEASE PRINT
COMPANY NAME .....
STREET ADDRESS .....
CITY ..... **ZONE NO.** ..... **STATE** .....
NAME ..... **TITLE** .....
This card void after 90 days.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

2

To The Oil and Gas Journal:
I would like to receive details on products advertised in your issue of April 26, 1954

Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	
Page____ By____		Page____ By____	

PLEASE PRINT
COMPANY NAME .....
STREET ADDRESS .....
CITY ..... **ZONE NO.** ..... **STATE** .....
NAME ..... **TITLE** .....
This card void after 90 days.

Your TIME SAVER

A SERVICE OF **THE OIL AND GAS JOURNAL**
FOR THE CONVENIENCE OF OUR READERS..

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

3

To The Oil and Gas Journal:
I would like to receive details on products advertised in your issue of April 26, 1954

Page____ By____	Page____ By____
Page____ By____	Page____ By____
Page____ By____	Page____ By____
Page____ By____	Page____ By____
Page____ By____	Page____ By____
Page____ By____	Page____ By____

PLEASE PRINT
COMPANY NAME .....
STREET ADDRESS .....
CITY ..... ZONE NO. ..... STATE .....
NAME ..... TITLE .....
This card void after 90 days.

Postage Will be Paid by Addressee

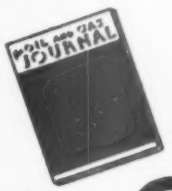
No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

1

as you **READ** through the pages of



and you **SEE**

PRODUCTS ADVERTISED

on which **YOU** WOULD LIKE MORE **INFORMATION**

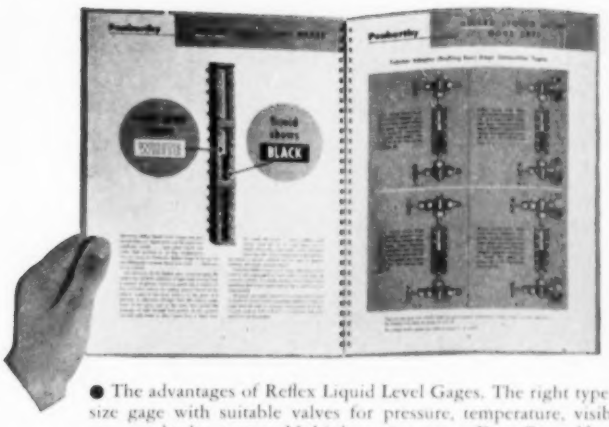
use one of these cards

NOTE PAGE NUMBER AND ADVERTISER ON CARD...

DROP IT IN OUTGOING MAIL
*NO POSTAGE REQUIRED

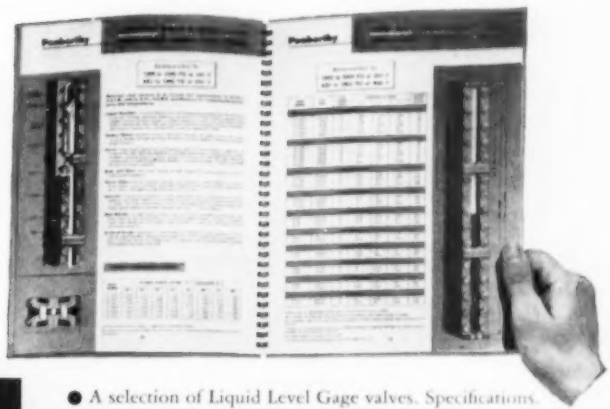
Your inquiry will be forwarded to the supplier within 48 hours (or less) from the time we receive it.

FACTS AT YOUR FINGERTIPS



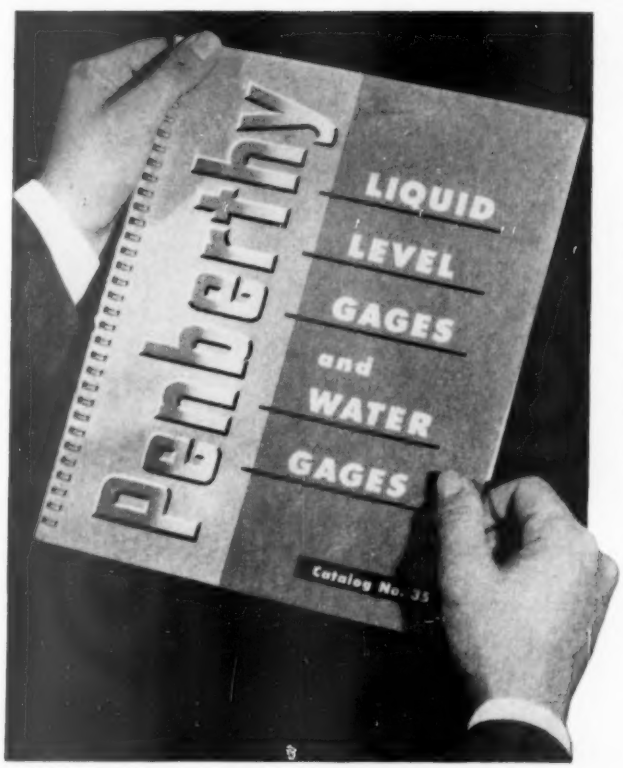
● The advantages of Reflex Liquid Level Gages. The right type and size gage with suitable valves for pressure, temperature, visibility range and valve centers. Multiple section gages. Drop Forged bodies. Pyrex glass. Basic and special designs.

● When to use Transparent Liquid Level Gage Sets. High pressure steam service. Adapters, valves, connections. Types available with recommendations.



● A selection of Liquid Level Gage valves. Specifications. "Floating Shank." Connections and special features.

● Metallurgical specifications. Gage glass and guard rods. Engineering service.



Penberthy's Catalog 35 is jam-packed with illustrated facts and specifications. It is your best guide to selecting the right liquid level gage sets at the most economical cost. In the complete Penberthy line, there are standard products for almost every application. Where your needs are special or unique, use the experience of almost 70 years to solve them. Take a tip from many thousands of satisfied users and write for your copy of Catalog 35.

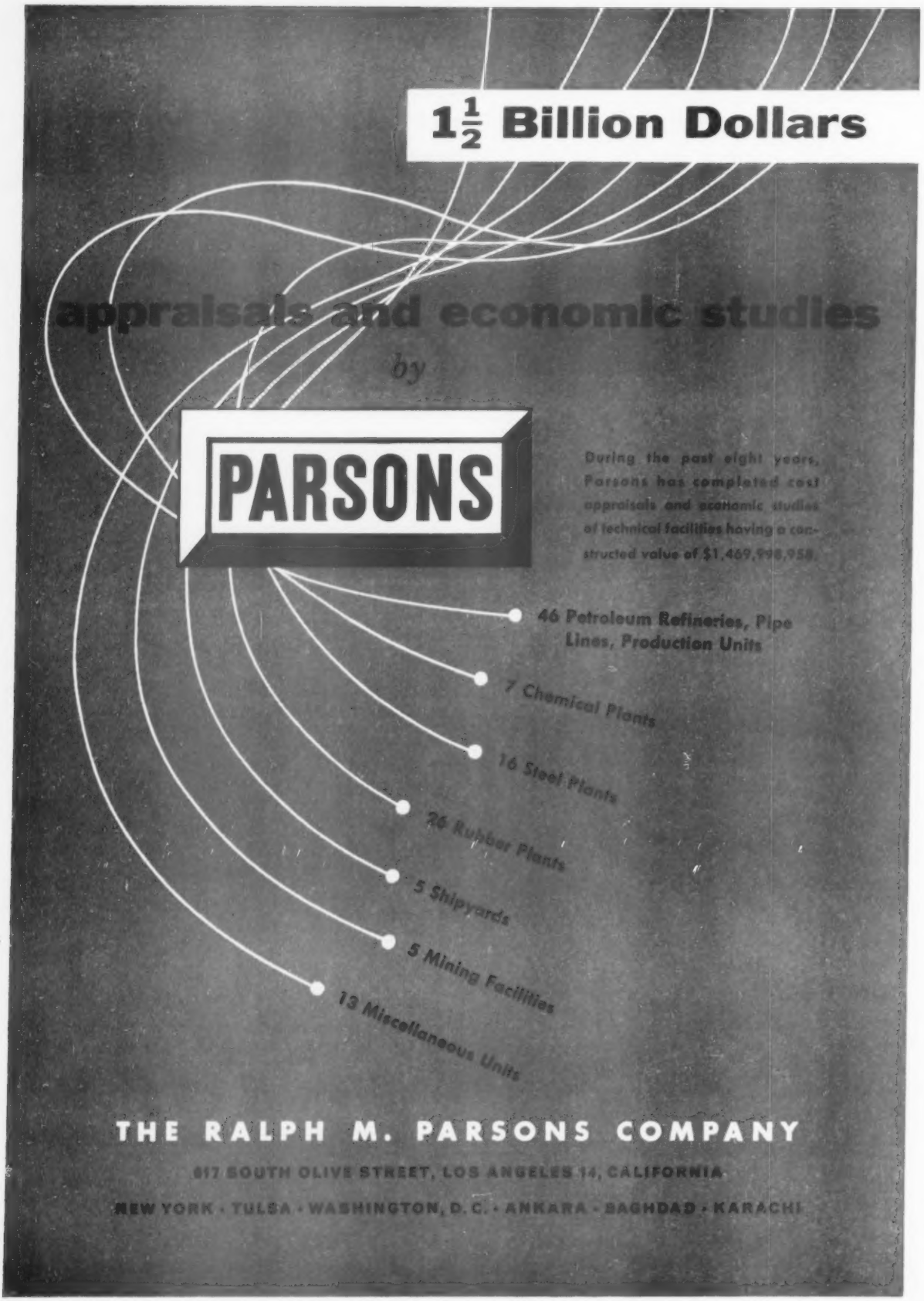
Established 1886

PENBERTHY INJECTOR COMPANY

Division of the Buffalo-Eclipse Corporation

1242 Holden Ave., Detroit 2, Michigan

There's *Certain* satisfaction in products by PENBERTHY


1½ Billion Dollars
appraisals and economic studies
by
PARSONS
During the past eight years, Parsons has completed cost appraisals and economic studies of technical facilities having a constructed value of $1,469,998,958.
46 Petroleum Refineries, Pipe Lines, Production Units
7 Chemical Plants
16 Steel Plants
26 Rubber Plants
5 Shipyards
5 Mining Facilities
13 Miscellaneous Units
THE RALPH M. PARSONS COMPANY
617 SOUTH OLIVE STREET, LOS ANGELES 14, CALIFORNIA
NEW YORK • TULSA • WASHINGTON, D. C. • ANKARA • BAGHDAD • KARACHI

The Right Move...

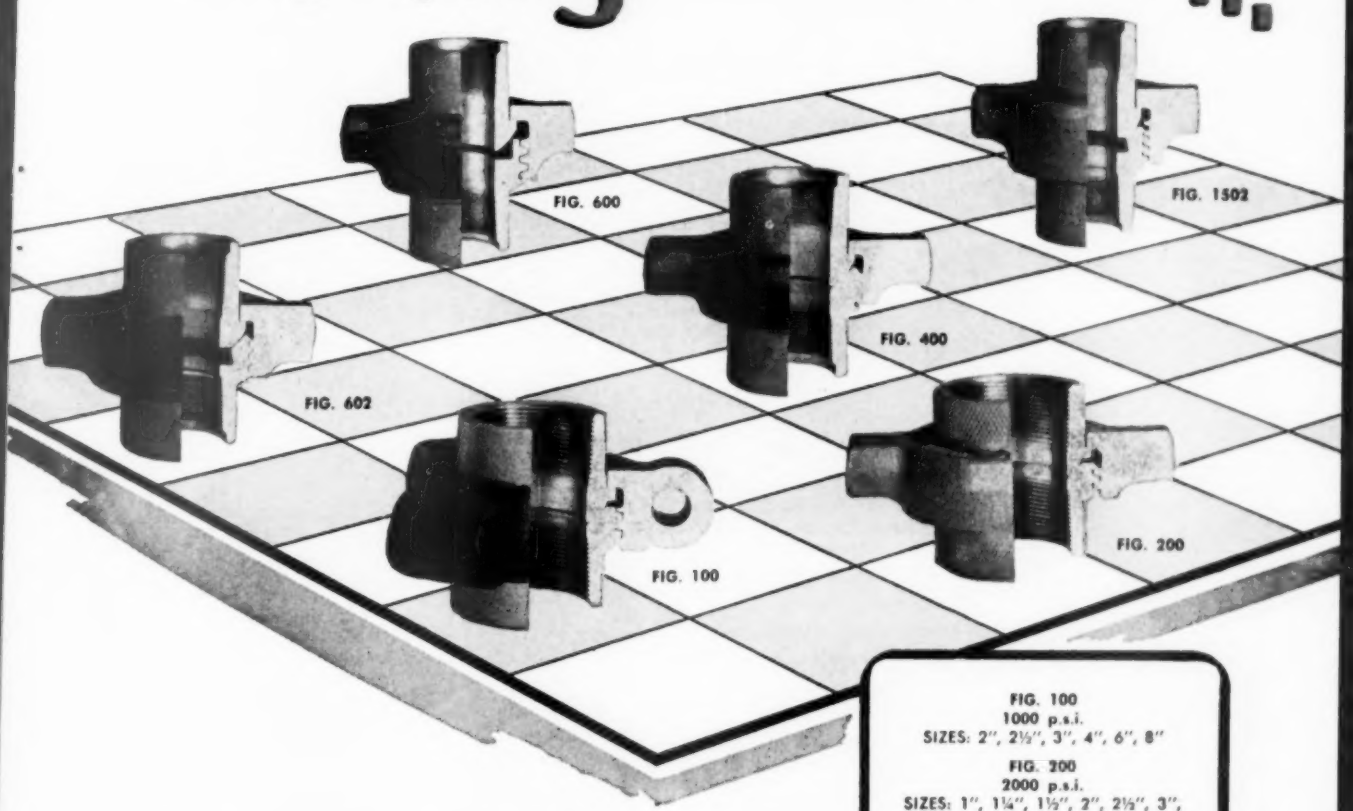


FIG. 100
1000 p.s.i.
SIZES: 2", 2½", 3", 4", 6", 8"

FIG. 200
2000 p.s.i.
SIZES: 1", 1¼", 1½", 2", 2½", 3", 4", 6", 8"

FIG. 400
4000 p.s.i.
SIZES: 2", 2½", 3", 4", 5½" O.D., 6", 7" O.D., 8", 10"

FIG. 600
6000 p.s.i.
SIZES: 1", 1½", 2", 2½", 3", 4"

FIG. 602
6000 p.s.i.
SIZES: 1", 1¼", 1½", 2", 2½", 3", 4"

FIG. 1502
15,000 p.s.i.
SIZES: 2", 2½", 3"

WECO UNIONS are *ALWAYS Right!*

You just can't make a wrong move when you standardize with WECO because there's a Union that is exactly right for every oil industry service from the drilling rig to the transport truck.

The famous ball and cone seat assures a positive seal. The strong durable construction assures long life and economy. They make up and break out repeatedly without damage to seats or threads.

Selected raw materials, advanced manufacturing practices, rugged Acme threads, heavier wall sections and precision seating surfaces mean you can trust WECO Unions for sealing and service.

PESA

it's wise to standardize with... WECO

WECO®

WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS

Fight corrosion with COLMONOY
HARD-FACING

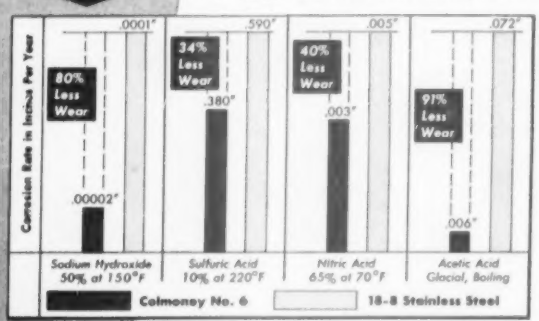
. . . one test showed the way!

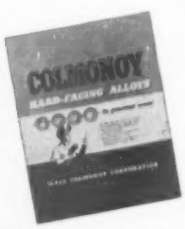
Plagued by the corrosive effects of chemicals upon pump shafts and similar parts, a leading detergent manufacturer now Spraywelds with COLMONOY hard-facing to protect all such equipment subject to abrasion and corrosion.

There's no need to incur high replacement costs on your chemical handling equipment when parts can be protected with COLMONOY hard-facing to last many times longer than in their original form.

A single test will convince you too!

Table shows metal loss in inches per year of 18-8 stainless and Colmonoy No. 6, caused by the corrosive media indicated.





Write today for the Colmonoy Hard-facing Manual 77 and the Spraywelder Catalog.

Table above shows how COLMONOY No. 6 gives superior resistance to many corrosive agents, as well as to abrasion and galling.

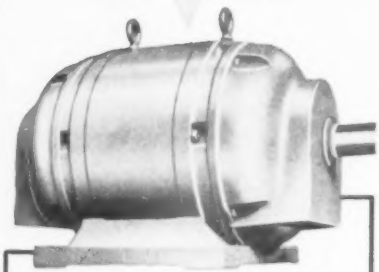
There are several ways to apply COLMONOY alloys. Spraywelding is economical and the fastest way to produce a superior hard-facing on cylindrical, machined parts.

HARD-FACING ALLOYS

19345 JOHN R STREET **WALL COLMONOY** DETROIT 3, MICHIGAN
CORPORATION

BRANCHES: BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON
LINDEN • LOS ANGELES • PITTSBURGH • MONTREAL • GREAT BRITAIN

5 REASONS WHY
LEASE after LEASE PUMPS with
FIELDMASTER
BALL BEARING
MOTORS



In the field you can depend on FIELDMASTER Ball Bearing Motors because they're **specially** built to meet the exacting demands of oil country use. Below are just five of the many **outstanding advantages** that make FIELDMASTER Ball Bearing Motors unsurpassed in their field!

1. Vermin Proof!

No matter how small, rodents and other animals can't get inside a FIELDMASTER Motor.

2. Drip Proof!

Special splash proof construction prevents damage to the motor from liquids and flying particles.

3. Moisture Proof!

Motor windings are specially treated for outdoor service . . . conduit box is moisture proof and dust tight.

4. Corrosion Resistant!

Weather-protected FIELDMASTER Motors can be used in any kind of weather — rain, snow, sleet, blowing sand and dust.

5. Forced Air Cooled!

This **exclusive** fan-cooling system provides cooler operation over **longer** periods of time.

May we ask our distributor, BETHLEHEM SUPPLY COMPANY, to contact you?

VALLEY ELECTRIC CORP.
4221 FOREST PARK BLVD., ST. LOUIS, MO.

BOOST PUMPS

Measures 8¼" wide x 9⅝" deep.

Boost 100 PSI. air pressure to 10,000 PSI, fluid pressure for $173.25 (FOB Gardena, Calif.). Eight standard models for output fluid pressures of 1,000 to 30,000 PSI. Special models for lower or higher pressures.

Don't let the low price fool you—it's amazingly efficient—on core ejections—sanded up pump barrels—static testing pipe and Christmas Trees. Complete power packages, too. Send for bulletins.

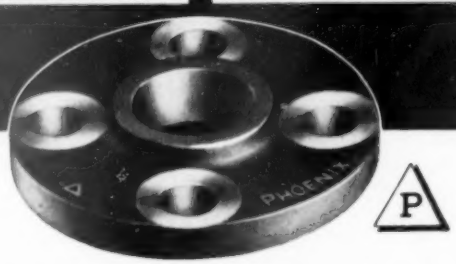
SPRAGUE

Engineering and Sales Corp.

1144 West 135th Street, Gardena, California

PHOENIX *Drop-Forged* FLANGES MEAN...

MAXIMUM STRENGTH



Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

NEW CATALOG!

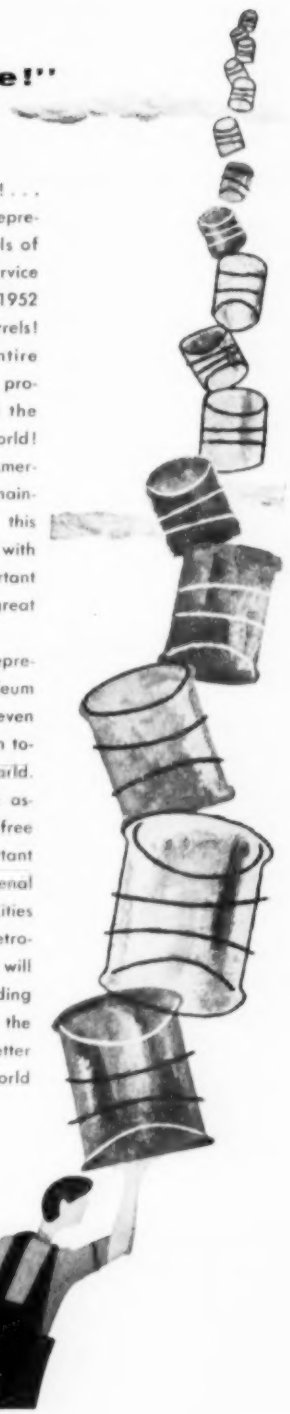
Send for free brochure showing Phoenix Complete Line.

FLANGE DIVISION

PHOENIX MANUFACTURING CO.

Catasauqua, Pa. • Joliet, Ill.

"only 237,630 more to fill before quitting time!"



A good day's work indeed!... and that amazing figure represents the number of barrels of liquid petroleum Cities Service refined every single day in 1952 ...a total of 86,735,000 barrels! In that same year, the entire American petroleum industry produced 54.3 percent of all the crude oil produced in the world!

Obviously, the aggressive American petroleum industry is maintaining world leadership in this vital field and Cities Service, with its vast production, is an important contributing member of this great petroleum family.

We in the United States represent the largest users of petroleum products in the world but even more important is our position today as leaders of the free world. Only our great strength can assure that our world will stay free ...and one of the most important segments of our freedom arsenal is the petroleum industry. Cities Service, one of the largest petroleum companies in the world, will continue to work toward finding new and better ways to serve the U. S. consumer... new and better ways to serve the cause of world freedom.

CITIES SERVICE

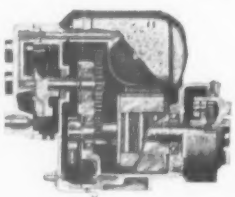
UNLIMITED RUNNING TIME FOR YOUR PUMPING ENGINES

When your pumping engines are equipped with Fairbanks-Morse Super Spark Magnetos be assured they are on the job making money for you day after day. These dependable magnetos are built to deliver efficient, economical and dependable service under the toughest operating conditions—cuts down-time—they rarely need attention or maintenance.

Standardize now on Fairbanks-Morse Super Spark Magnetos and cinch low cost trouble-free performance. See your Fairbanks-Morse service station or distributor or write Fairbanks, Morse & Co., Magneto Division, Beloit, Wisconsin.

ENGINEERED FOR TOUGH SERVICE

- Compact, rugged, self-contained unit—few working parts
- Steady hot spark at all speeds
- Large, long lasting breaker points for quick starts—smooth performance
- Oversize high tension coils—built to take a beating



- Sturdy impulse coupling of simple design for easy starting
- Alnico Super Magnets cast into powerful one-piece magnetic rotor

This is type FM-XOR six cylinder magneto with ball bearings throughout—available in base or flange mounting.

FAIRBANKS-MORSE
a name worth remembering when you want the best

MOTORS • ZC ENGINES • MAGNETOS • PUMPS • DIESELS

CANNON PLUGS

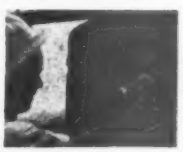
chosen for quality in geophysical explorations...

W Series...rugged heavy duty watertight

well logging...

K Series...for sensitive instrumentation

pumping engines...



GB Series...for pumping engine starting

Cannon Plugs are important components affecting the portability, flexibility, and better maintenance of oilfield electrical and electronic equipment.

In geophysical exploration, well logging operations, Cannon's Series P, X, XL, K, AN, DP and W plugs are widely used. For power supply, engine starting and high current applications, the rugged GB Series provides a wide variety of services. The petroleum industry has found that Cannon Plugs increase operational efficiency wherever they're used. For an easy-to-understand summary of the vast Cannon line, send for the Cannon Plug Guide, or AN, K, GB Bulletins.

CANNON ELECTRIC COMPANY, 3209 Humboldt St., Los Angeles, Calif. • Factories in Los Angeles; East Haven; Toronto, Canada; London, Eng. Representatives and distributors in all principal cities.

Refer to Dept. 164

Since 1915

CANNON ELECTRIC

STOP *Vapor Losses*

with OCECO "Type B" VENT UNITS

● Combined flame arrestor and conservation vent valve. These units protect both the tank and tank contents from entrance of flame; control and restrict tank breathing and prevent the free escape of vaporized liquids and lowering of gravity ratings. Sturdy, dependable, efficient and trouble-free Oceco construction. 2" to 10" sizes. *Write for Catalog 474-R. It gives full details.*

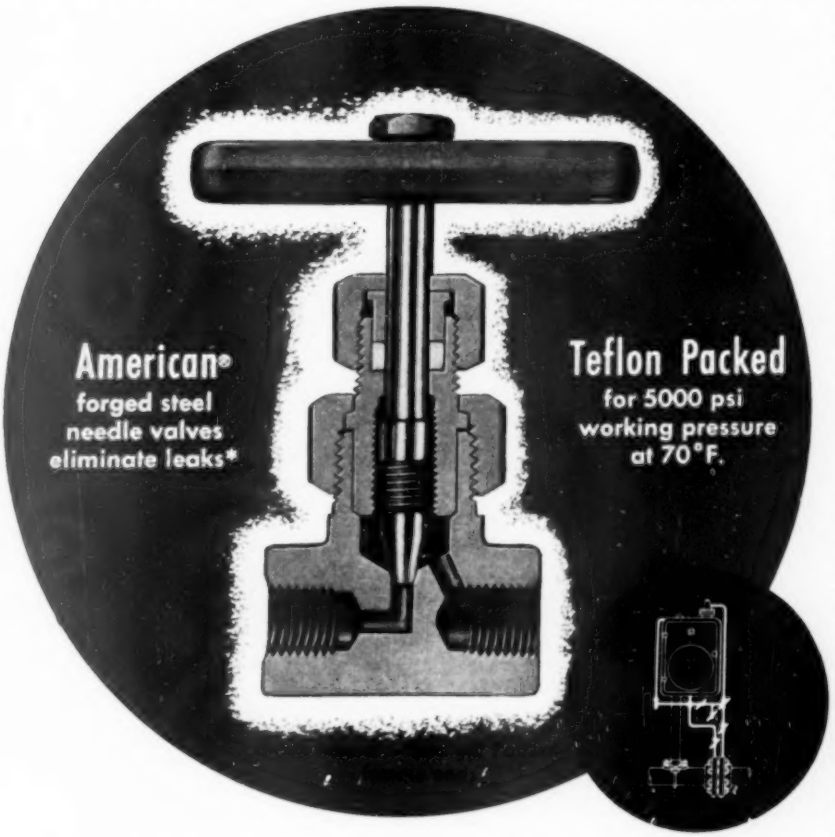
OCECO TANK FITTINGS

THE JOHNSTON & JENNINGS CO.

division of PETTIBONE MULLIKEN CORP.

4751 West Division St. • Chicago 51, Illinois

HOW TO SOLVE THE tough NEEDLE VALVE PROBLEMS



UNION BONNET
ANGLE PATTERN
(Female Ends)

SCREWED BONNET
STRAIGHT PATTERN
(Female Ends)

SCREWED BONNET
ANGLE PATTERN
(Female Ends)

SCREWED BONNET
STRAIGHT PATTERN
(Male End)

SCREWED BONNET
ANGLE PATTERN
(Male End)

SCREWED BONNET
STRAIGHT PATTERN
(Union End)

Teflon-packed American Needle Valves "lick" the really tough meter manifold jobs — sour gas, wet gas, odorizing, chemical plant and refinery applications and other difficult and corrosive field services.

Precision machined valve bodies (stainless or carbon steel) are specially suited for welding. Stainless steel valve stems, centerless-ground for exact fit, are designed so that the valves can be repacked under pressure. Positively aligned valve seats are burnished for point-contact seating.

Every valve is hydrostatically tested. Standard valves are designrated for 5000 psi working pressure at 70°F. Valves are also available for higher pressures to 10,000 psi and can be furnished, with graphite impregnated asbestos packing, for temperatures above 450°F.

Write for Complete Specifications.

**In actual tests, Teflon packing prevented gland leakage through 124,000 on-and-off cycles, without tightening the packing nut.*

AMERICAN® METER COMPANY
INCORPORATED ESTABLISHED 1836

AMERICAN METER CO
EST. 1836
MEASUREMENT ENGINEERS

GENERAL SALES OFFICE: 1513 Race Street, Philadelphia
Albany • Alhambra • Atlanta • Baltimore • Birmingham
Boston • Chicago • Dallas • Denver • Erie • Houston
Kansas City • Los Angeles • Minneapolis • New York
Omaha • Pittsburgh • San Francisco • Seattle • Tulsa
IN CANADA: Canadian Meter Company, Limited
Hamilton, Ontario • Edmonton, Alberta

H_2S Removal for $76 Per Million Feet

. . . Stanolind's experience using amine units

by R. A. Feagan, H. L. Lawler, and M. H. Rahmes

SOUR natural gas must be treated for removal of hydrogen sulfide to produce marketable gas. The processes most widely used at the present time in the natural-gas industry employ solutions of the ethanolamines, which are organic bases that have the property of reacting chemically with acidic gases at normal temperatures to effect their removal, but releasing them by decomposition of the amine salts at elevated temperatures. This property lends itself to a continuous process wherein sour gas is contacted at ordinary temperatures in one column by a circulating amine stream which is regenerated at the boiling point temperature and usually at lower pressure in a second column. Details of the process have been described adequately in the literature.[1,2,3,4,5] The process accomplishes essentially complete removal of carbon dioxide as well as hydrogen sulfide and will produce sweet gas which will meet readily the usual specifications of 0.25 grain H_2S per 100 cu. ft.

Authors are with Stanolind Oil & Gas Co., Tulsa. Paper presented at N.G.A.A. meeting, Dallas, April 21-23, 1954.

The process may employ either monoethanolamine-water solutions for removal of hydrogen sulfide and carbon dioxide only or may employ a mixture of monoethanolamine, diethylene glycol and water for simultaneous sweetening and dehydration. Diethanolamine solutions are sometimes employed, but find their principal application in refineries. The following discussion, however, deals solely with units employing MEA-H_2O solutions.

Operating problem . . . Much has been said and written about the design of H_2S-removal units, and in recent years, a number of publications have discussed corrosion problems, particularly in amine-glycol systems.[6,7,8,9] In spite of the relatively long time that amine units have seen commercial application—and in spite of a substantial research effort by the users, plant designers, and manufacturers of amines and alloys—amine units continue to be a source of trouble and expense to many plant operators.

It is the purpose of this article to summarize briefly the tentative conclusions one company has reached based on 4 to 5 years' experience operating five H_2S-removal units with aqueous monoethanolamine and on study of the experiences of other companies in this field. It must be emphasized that these conclusions regarding aqueous-amine-unit design and operation are tentative since all variables have not been sufficiently explored.

Experience With Five Units

During 1953, the five H_2S-removal units under discussion processed gas at a total average rate of 205,300 M.c.f. per day, and extracted acid gas (H_2S and CO_2) at a total average rate of 10,600 M.c.f. per day at a total cost

READY TO SERVE YOU IN ALL PHASES OF YOUR CANADIAN OIL OPERATIONS

- Credit for Financing Purposes
- Foreign Exchange for Equipment
- Letters of Credit
- Information and Advice
- Complete Oil Banking Services

The Bank of Toronto has fully qualified and experienced oil bankers to serve your interests at the core of Canada's richest oil boom. All our services are at your disposal to give complete, on-the-spot attention to every phase of your Canadian oil interests.

Write today for full particulars—you'll appreciate our Canadian contacts in the Canadian oil industry.

A. R. Profit, Manager, The Bank of Toronto, *Calgary, Alberta, Canada*

I. J. Hutton, Manager, The Bank of Toronto, *Edmonton, Alberta, Canada*

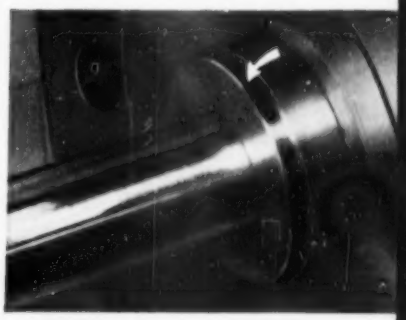
Oil Representative, P. W. Atkinson, *Calgary Branch*

THE BANK OF TORONTO

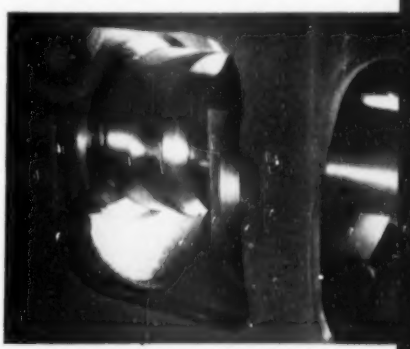
Established 1856

Head Office, Toronto, Canada

1. FASTER MAINTENANCE. To repack (or change a mechanical seal), this shutoff assembly is turned like a valve, quickly sealing tank contents from mixer.



2. SHAFT RETRACTS, squeezing a Teflon gasket inside the tank between seal collar and mixer end cap, positively preventing loss of product.



3. MECHANICAL SEAL (optional) can be removed from shaft as a unit, for quick easy replacement. You can change seals without draining the tank and without dismantling the mixer.

NO SHUTDOWNS . . . *EVER* . . . to repack these mixers

Any fluid mixer on a big tank sooner or later requires some maintenance. A stuffing box needs repacking. A mechanical seal has to be replaced.

You can't always wait for the tank to be empty. You don't want to waste time draining the tank.

And you don't have to do either.

You can repack the stuffing box (or replace the mechanical shaft seal) on a LIGHTNIN Side Entering Mixer, without ever draining the tank. You can do it in a few minutes—under a full head of 5 million gallons—without losing a pint of product.

EASY AS CLOSING A VALVE A few turns of the easy-to-get-at shutoff assembly prepare the mixer for repacking (or seal change). Every part is easily accessible.

You're always protected against mechanical seal failure. The LIGHTNIN shaft seal (optional now on side entering mixers) is a complete "package" unit—quickly replaceable at any time, without removing the mixer from the tank.

This is just *one* good reason why it pays to specify LIGHTNINS for blending, treating, TEL addition, bottom sediment control in crude storage tanks, and other big mixing operations.

For quick, competent help—and fully guaranteed results—on *any* fluid mixing job, big or small—call in your LIGHTNIN representative. Or write us today.

Lightnin® Mixers

GET THESE HELPFUL FACTS ON MIXING

LIGHTNIN Catalogs contain practical data on impeller selection; sizing; best type of vessel; installation and operating hints; full description of LIGHTNIN Mixers. Yours without obligation. Check and mail coupon today.

MIXCO fluid mixing specialists

- ☐ DH-50 and DH-51 Laboratory Mixers
- ☐ B-102 Top Entering Mixers (turbine and paddle types)
- ☐ B-103 Top Entering Mixers (propeller type)
- ☐ B-104 Side Entering Mixers
- ☐ B-106 Condensed Catalog (complete line)
- ☐ B-107 Mixing Data Sheet
- ☐ B-108 Portable Mixers (electric and air driven)
- ☐ B-502 Mud Mixers (oil well drilling)
- ☐ B-503 Mixers for BS&W Control

MIXING EQUIPMENT Co., Inc.

174-d Mt. Read Blvd., Rochester 11, N. Y.

In Canada: William & J. G. Greey, Ltd., 100 Miranda Ave., Toronto 10, Ontario.

Please send me, without obligation, catalogs checked at left.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

(not including utilities, amortization, or overhead) of $808 per day, or about $76 per M.M.c.f. of acid gas extracted. This expense can be roughly broken down as follows: maintenance, repairs, etc., 50 per cent; chemicals (primarily amine), 31 per cent; and operating labor, 19 per cent. Thus, the problems are, in the order of their importance, corrosion, amine losses, and frequency of operating upsets (such as foaming, failure to sweeten gas, etc.) calling for more operator attention and, consequently, higher operating labor costs.

Range of costs . . . The average gas processed by the five units during 1953 ranged from 8,800 to 88,700 M.c.f. per day, acid gas removed ranged from an average of 330 to an average of 7,280 M.c.f. per day, and total average operating cost ranged between $49 and $298 per M.M.c.f. of acid gas removed. Design amine circulating rate for the five plants ranges between 97 and 1,515 g.p.m., design gas-handling capacity between 12 and 120 M.M.c.f. per day, design acid-gas content between 0.9 and 24.5 per cent of the inlet gas. The units were designed and built by several different contractors, two of the plants feature "split flow" regeneration and one of these two is designed for "pressure" regeneration.

Costs mentioned above are substantially lower than those experienced during the early period of operation of these plants because of the numerous changes in design and operation made in some of the plants since startup. Some of the costs reflect substantial expenditures for major repairs or revisions.

Corrosion . . . This has been experienced primarily in the reactivator reboilers, reactivators, solution pumps, heat exchangers and related piping. Reboiler life has ranged from 2 months to more than 1 year in the same plant, with the improvement credited to changes in design and operating practices. Carbon-steel reboilers in other plants have lasted several years. One carbon-steel reactivator tower has been completely replaced, two others repaired and modified after bubble-cap trays were corroded away. A number of heat-exchanger bundles have required repair or replacement while others have not failed to date.

All of the plants have experienced corrosion to some extent but, to date, the cost of corrosion in two of the plants has been small.

Amine losses have varied widely, foaming has been experienced at times, and there have been a few times that difficulty has been experienced in meeting sales gas specifications.

Some Recommendations

Obviously, time will not permit presentation of a detailed description of all operating experiences with these five units during the past 4 to 5 years. The brief descriptions above, however, were presented to indicate the type and scope of experiences upon which the following conclusions and recommendations have been based.

The following paragraphs will outline these conclusions and recommendations with a short discussion of each of them. As is so often the case, there must be a compromise, or economic balance, between initial investment and operating and maintenance costs. The authors do not have the data to draw this line precisely.

Some of the following suggestions may seem obvious but they are included to make the list as complete as possible.

For convenience, the recommendations are divided into two groups: (1) those which must be considered by the plant designer, and (2) suggestions for the plant operator.

For the Designer

The designer should:

1. Provide sufficient capacity to permit operating with low amine concentra-

In today's fast-moving economy, you must have speed . . . speed in refining . . . speed in marketing, to keep abreast of competition. When you remodel or build a new plant, you want the job done quickly and efficiently, to get back into production.

REFINERY ENGINEERING Company has the reputation of getting the job done on schedule, *or before.* When you place a contract with TRECO, you want *and will receive* careful planning and engineering, sound workmanship and *speed of construction.*

Why don't you let us discuss with you, the remodeling of your present facilities or the building of a complete new refinery? No job is too small nor too large to receive the complete attention of every member of the TRECO staff. That is why ninety seven per cent of all TRECO customers give us repeat business.

TRECO
REFINERY ENGINEERING Company
TULSA, OKLAHOMA TORONTO, ONTARIO

UNIFORM

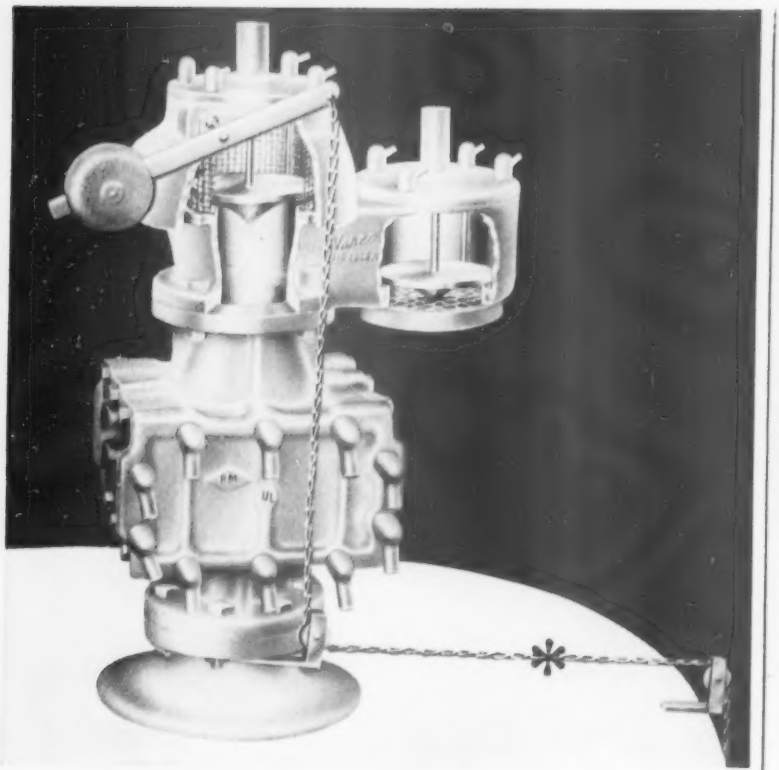
Larkin Bull Plugs and Swage Nipples are produced by the most modern machine tools from the best of raw materials. They are exactingly checked during each step of the manufacturing process.

Protective coated, clearly and accurately labelled, carefully boxed for shipment, they come to you as precision fittings suitable for any service.

LARKIN PACKER CO., INC.
St. Louis, Mo.

All Larkin fittings are seamless and weldless. A-8620 (refinery alloy) fittings are available in sizes through 2"

LARKIN
...Through Your Supply Store



EFFICIENT VENTING CUTS VAPOR LOSS

Considerable profits are dissipated to the atmosphere when vent pallets warp, stick open or prevent excessive "blowdown." "VAREC" Fig. No. 5800 Conservation Vent Units are ideal equipment for venting volatile or inflammable liquid storage. They protect against dangerous over and under pressures and accidental ignition. Streamlined passages insure maximum flow. Regrindable and renewable metal pallet seats provide extra long life. Drip rings eliminate condensate collection, reducing possibility of freezing. Hyperbolic pallets, loosely guided, prevent sticking and minimize flutter. Flame Arrester unit listed by Underwriters' Laboratories and approved by Factory Mutual Laboratories. Send for free Bulletin CP-2001.

* *Remote Control Flame Snuffer Sheave Brackets, Fig. 130 are optional at extra cost. This assembly is preferable where vent unit is set back from edge of tank.*

"Varec"

THE VAPOR RECOVERY SYSTEMS COMPANY

COMPTON, CALIFORNIA

Cable Address: VAREC COMPTON CALIF. (U.S.A.) All Codes

SALES OFFICE AT:

Boston 11, Mass.
Chicago 6, Ill.
Detroit 26, Mich.
Honolulu, Hawaii
Houston, Texas
Minneapolis, Minn.
New York 7, N. Y.
Pittsburgh 19, Pa.
San Francisco, Calif.
St. Louis 20, Mo.
Seattle, Wash.
Tulsa 9, Okla.

FOREIGN SALES AGENCIES AT:

ARGENTINA, Buenos Aires	H. Hennequin & Cia. Av. Belgrano 881
BELGIUM, Brussels	Etab. Emeric Kroch, 75 Blvd. Clovis
BRAZIL, Rio de Janerio	Sociedad Importadora de Equip., Av. Calogeras No. 15-7 S/708
CANADA, Montreal	Peacock Bros. Ltd. Town of La Salle
CANADA, Toronto	J. F. Comer Co., 508 Federal Bldg., 85 Richmond St. West
HOLLAND, Amsterdam C	Comprimo N. V. Amstel 21C
JAPAN, Tokyo	American Japan Trading Co., 213 Chrom Ginza Chuo-Ku
MEXICO, Mexico City 4, D.F.	Schultz y Cia., S.A., Col. San Rafael, Sullivan 119
SWEDEN, Stockholm	Kemi-Intressen, P.O. Box 16363
SWITZERLAND, Zurich	Urania-Acessories, Newmuhlequai 24
VENEZUELA, Barcelona	Waldrip-Campbell, Apartado 30
VENEZUELA, Marcaibo	Waldrip-Campbell, Apartado de Correo 594

FOREIGN MANUFACTURING LICENSEES:

ENGLAND, London	Wm. Neil & Son, Ltd., 38 Victoria St. S.W.1.
FRANCE, Paris	Compagnie Tech. des Petroles, 134 Blvd. Haussman

58-1

Why pull the well so often?

Use **DARCOVA**

composition valve cups, seating cups and rings

The Original composition valve cup *still the best!*

YOU'LL SAVE MONEY BECAUSE..

• Precise control of all materials and processes from lab to well means exceptional resistance to wear and deterioration . . . fewer pulling jobs! • Different textures, scientifically developed, fully proved, give peak efficiency and longer flex-life at any depth! • Precisely controlled sizes for any make or size pump . . . no misfit inefficiency! • Ask for genuine Darcovas at your supply store.

DARLING VALVE & MANUFACTURING COMPANY

DARCOVA

THE ORIGINAL COMPOSITION CUP

WILLIAMSPORT 1, PA.

tions . . . Experience in the five plants discussed above has indicated a correlation between loading on the unit and corrosion troubles. The plants experiencing the least amount of corrosion have sufficient solution circulating capacity to permit satisfactory gas sweetening with amine concentration in the order of 8 to 10 per cent. While it might not be economical to design a unit for such low solution concentration, it is recommended that a design concentration of 15 per cent MEA be used rather than the 20 to 30 per cent often proposed by investment-cost-conscious designers.

2. Avoid excessive reboiler heating medium temperatures . . . If steam is used for heating, excessive temperature is not usually a problem although there are indications that reboilers designed for relatively low heat flux, i.e., low-pressure steam in the order of 50 to 75 psig., might have longer life than reboilers using high-pressure steam. If other heat medium is used, such as hot oil, experience has shown that the problem can be critical. Both carbon-steel and stainless-steel reboiler bundles have failed in about 2 months when heated by oil entering at approximately 550° F.

If hot oil is used, it is believed that the maximum temperature should be restricted to about 400° F.[9] in an effort to limit amine film temperature. It should be recognized that even minor leaks may cause difficulties resulting from contamination of the solution by oil.

3. Avoid use of dissimilar metals . . . This applies particularly to regenerators and reboilers. Certain critical regenerator internals were constructed of stainless steel in one of the plants mentioned above. This caused serious bimetallic corrosion of the carbon steel shell at the point of contact. The same phenomenon has been experienced in hot amine lines (carbon steel) where some of the fittings were carbon-moly steel.

4. Give consideration to packed and lined regenerators rather than bubble tray towers . . . After encountering serious corrosion in several carbon-steel towers equipped with carbon-steel bubble trays, several of the regenerators in the five plants have been revamped, bubble-cap trays removed, the regenerators lined with a 2-in. sprayed cement mixture, and Raschig rings installed to replace the bubble-cap trays. This system has proved satisfactory and has been adopted for a new plant design.

5. Provide a suitable amine reclaimer. This is a small batch still operating on a slip stream amounting to ½ to 1 per cent of the design circulation rate. Its purpose is to remove from the circulating amine soluble but nonvolatile impurities such as decomposition and oxidation products of amine which are thought to contribute to corrosion. Usually a small amount of soda ash is added either directly to the reclaimer or to the circulating solution to accomplish more complete recovery of amine in the redistillation operation. Our experience indicates that amine redistillation is an important step in reducing corrosion.

Decomposition of amine in the circulating system can be shown by comparing the results of several methods of analyses. Acid titration determines the total alkalinity, the Van Slyke indicates the primary amine group, and the Kjeldahl determines total nitrogen. All of these methods will give essentially identical MEA contents on a fresh solution. When decomposition begins or some reaction ties up or destroys the primary amine group, determinations by the three methods will begin to diverge.

Another test used to indicate the corrosiveness of amine solution is the so-called "iron capacity test." In this test, the amine to be tested is contacted un-

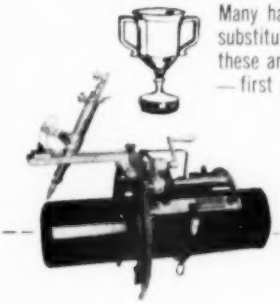
① **THE H & M MACHINE:** The lightest, semi-automatic pipe beveling machine ever made. Now you can cut and bevel 36" diameter pipe quickly, accurately with the #5 H & M **weighing only 95 lbs.** Proportionate weight reductions in the other H & M cutters and bevelers.

② **SHAPE CUTTING:** You can reduce the time consumed in shape cutting **up to 95%** with H & M semi-automatic shape-cutting equipment. One master template furnished with each shape-cutter. Write for your free copy of "More Profit Dollars for All Types of Pipe Fabrication Work."

③ **OUT-OF-ROUND:** For simple, fool-proof cutting and beveling of out-of-round pipe get the H & M out-of-round attachment, manufactured to fit all H & M Pipe Cutting and Beveling Machines. The roller guide follows the pipe contour . . . the torch follows the roller guide.

Why H & M is the FIRST name in pipe-beveling.

Many have imitated H & M design, but none have found a substitute for H & M quality. Accuracy . . . durability — these are features that are part of the H & M brand. H & M — first in its field . . . and now 40% lighter.



H & M PIPE BEVELING MACHINE COMPANY

311 E. THIRD • TULSA, OKLA. • PHONE 3-0241

PULL A VACUUM AND SWAB THE WELL CLEAN

with GUIBERSON GW CUPS

GW Cups Assembled on famous Guiberson K Swab

Save time . . save money . . save fluid . . with GW cups . . with K Swabs —products of Guiberson's more than a third century's experience serving the oil industry.

If you want to *swab*—not just agitate—flexible Guiberson GW cups on the Type K Swab will pull every drop. They hug the casing wall — provide automatic seal and controlled pipe contact — pull a vacuum and clean the well!

Precision molded in Guiberson's own rubber plant from special abrasion resistant compound, GW cups take up their own wear. Made up on the K Swab, they are unexcelled in rough or mixed casing strings — for unloading shallow wells. Won't down-swab or hang on casing collars. Interchangeable on famous K Swab.

THE

GUIBERSON

CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

der certain specified and controlled conditions with powdered iron. The amount of iron dissolved is reported in parts per million. To illustrate the effectiveness of amine reclaimers, results of tests on overhead and bottom streams from one reclaimer are shown by Table 1.

TABLE 1

Determination—	Feed	Bottoms	Overhead
Acid titration, as per cent MEA	17.5	45.1	19.5
Van Slyke, as per cent MEA	14.5	29.6	17.0
Kjeldahl, as per cent MEA	17.4	71.3	21.0
Iron capacity, p.p.m.	47	1,204	4

6. Provide an effective filter . . . In spite of all normal precautions, some corrosion takes place in amine systems. Corrosion products are in the circulating solution in the form of finely divided iron sulfide. This sludge has caused fouling of heat-exchanger surfaces, plugging of some valves and lines, erosion of metal surfaces, and even plugging of the regenerator and contactor columns. Several types of filters have been tested. It has been concluded that the precoated-type filter using diatomaceous filter aid, although more expensive, is most satisfactory. It ordinarily operates on a slip stream from the hot rich amine to the regenerator.

7. Stress-relieve major equipment . . . Stress relieving adds relatively little to the cost of equipment. Experience has shown that stress cracking is likely to occur in amine units, particularly where hot amine comes in contact with carbon steel that is not stress-relieved. Some stress corrosion has been reported even in amine contactors. Consequently, the practice has been adopted of stress-relieving all major items of equipment.

8. Design for lower reactivator operating pressure . . . Many amine units have been designed for "pressure regeneration" because higher operating pressure, in the range of 30 to 50 psig., increases the bottom temperature of the regenerator and is believed to result in more complete stripping of the solution, particularly with respect to CO_2. This improvement in stripping should permit designing for a larger acid-gas pickup per gallon of solution circulated; therefore, reducing the design circulation rate.

While experience is conflicting in this regard, there are indications that higher reactivator operating pressure increases reboiler, exchanger, and regenerator tower corrosion. Consequently, the practice has been adopted of designing for minimum reactivator pressure, the lower limit being set usually either by the pressure required to supply the acid gas to a sulfur plant or by the pressure required to force amine out of the regenerator through heat exchangers to a surge drum or pump suction.

9. Provide an efficient inlet scrubber to prevent liquid hydrocarbon from entering the amine contactor.

10. Design for low solution losses . . . Experience has shown that excessive solution losses are due to mechanical leakage or to amine entrainment; therefore, solution pumps should be equipped with efficient mechanical seals, an efficient residue gas scrubber should be provided to recover amine entrainment from the contactor, one or two water-wash trays should be provided in the top section of the contactor and provision should be made to collect and reclaim any solution drained from equipment.

For the Operator

All designers know that even a well-designed plant will not be satisfactory with careless or improper operation. In addition to following the more obvious measures to assure sweet gas, the operator should:

YOU GET
Fast Service
on An-Spec Quality
Magnesium anodes . . .
• Quality spectrographically analyzed anodes.
• Fast Service
• Custom manufacturing for special problems.
• Consulting and engineering service.
When you dump your cathodic protection problems in our lap . . . we get your anodes to you in record time. Our reputation for taking care of customers in a hurry is one of our biggest assets. You can depend on our consulting and engineering service to solve your anode installation problems.
ANODE SPECIALISTS
AN·SPEC
PIPE LINE Anode CORPORATION
25th WEST AVENUE AND SAND SPRINGS ROAD
P. O. BOX 996
TULSA, OKLAHOMA
DISTRIBUTORS:
Pipeline Supply Company 2230 Magnolia Street Birmingham, Alabama
Cross Pipeline Equipment Company 858 Wilson Avenue Newark, New Jersey
Cross-Curran, Ltd. 11102 Jasper Avenue Edmonton, Alberta
Pipeline Supply Company 912 West 11th Houston, Texas

1. Use lowest amine solution strength which will give consistently sweet gas under the load conditions prevailing. This will reduce corrosiveness of the solution and will also reduce amine losses.

2. Establish and maintain effective reclaimer operation.

3. Establish and maintain effective filter operation.

4. Maintain equipment to prevent mechanical losses.

5. Operate the amine contactor with gas outlet temperature slightly higher than inlet temperature. This will prevent condensation of hydrocarbons in the contactor. Condensing hydrocarbons are believed to cause foaming and solution carryover. In some cases, foaming has been experienced even while this precaution was being observed. In these cases, it has been necessary to resort to a foam inhibitor such as octyl phenoxy ethanol.

The preceding discussion is not intended to present a complete list of problems which might be encountered during the design or operation of aqueous amine gas sweetening units, nor is it to be inferred that the above-listed suggestions offer the optimum solution to any problem. Some of the suggestions apparently have solved satisfactorily some of the problems but in many cases the steps taken have only reduced the severity of the problem. Also, it is recognized that experience of other companies may have led them, with good reason, to different conclusions.

References

1. "Recent Design Developments in Amine Gas Purification Plants," R. M. Reed and W. R. Wood, Trans. A.I.Ch.E., Vol. 37, June 25, 1941.

2. "How to Rid Natural Gas of Undesirable Sulfur Compounds," Leroy Culbertson and J. S. Connors, The Oil and Gas Journal, August 11, 1952, pp. 114-117.

3. "Improved Design Operating Techniques for Girbitol Absorption Processes," R. M. Reed, Petroleum Processing, December 1947, p. 907-912.

4. "High Purity Natural Gas by the Glycol-Amine Process," W. F. Chapin, Petroleum Refiner, June 1947, pp. 109-112.

5. "Technical Aspects of Glycol-Amine Gas Treating," Arthur L. Kohl and Clyde L. Blohm, Petroleum Engineer, June 1950.

6. "Corrosion Problems in Gas Purification Units Employing MEA Solutions," F. C. Riesenfeld and C. L. Blohm, Petroleum Refiner, April 1950, pp. 141-150.

7. "Corrosion in Amine Gas Treating Plants," F. C. Riesenfeld and C. L. Hughes, Petroleum Refiner, February 1951, pp. 97-106.

8. "Corrosion Resistance of Alloys in Amine Gas Treating Systems," F. C. Riesenfeld and C. L. Blohm, Petroleum Refiner, October 1951, pp. 107-115.

9. "Corrosion in CO_2-H_2S-Amine System," K. L. Hujsak, G. R. Davis and E. C. Carlson, Chemical Engineering Progress, July 1952, pp. 333-336.

WHEELING
COUPLINGS
FOR OIL COUNTRY USE
LINE PIPE COUPLINGS A.P.I.
⅛" to 12"—Seamless and Special Processed—Black or Galvanized
PLAIN TUBING COUPLINGS A.P.I.
1" to 3"—Seamless
EXTERNAL UPSET TUBING COUPLINGS A.P.I.
¾" to 3½"—Seamless
CASING COUPLINGS A.P.I.
4½" to 13⅜"—Long or Short
HYDRAULIC COUPLINGS
⅛" to 4"—Seamless
REAMED AND DRIFTED A.I.S.I.
¾" to 12"—Seamless or Special Processed
DRIVE PIPE COUPLINGS
⅜" to 12"—Seamless or Special Processed
TOP QUALITY Since 1918
Sales Offices in Leading Cities:
Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore, Md.—Ted Barto, 2301 No. Charles St.
Chicago, Ill.—Harry A. Jay, Suite 1090, Old Colony, Bldg.
Denver, Colo.—Earl H. Jones & Co., 1863 Wazee St.
Detroit, Mich.—Thomas L. Osberger, 10226 Woodward Ave.
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass.—Walter S. Bennett, 53 Minot St.
Ferguson, Mo.—Wm. H. Heckenberg, 635 No. Florissant Rd.
Houston, Tex.—Henry H. Paris Distributor, Inc., Box 932
Los Angeles, Cal.—James A. Riordan Co., 1400 Santa Fe Ave.
Minneapolis, Minn.—Lin J. Krause, 200 Lumber Exchange
Narberth, Pa.—J. W. Worthington, 105 Forrest Ave.
New York, N. Y.—Henry Stein, 50 Cliff St.
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
San Francisco, Cal.—Earl H. Jones & Co., 1150 Folsom St.
Seattle, Wash.—Earl H. Jones & Co., 819 Thomas St.
Summit, N. J.—Ira L. Rothenberg & Assocs., P. O. Box 475
WHEELING MACHINE PRODUCTS COMPANY
WHEELING, WEST VIRGINIA
Factories at WHEELING, W. VA. and WOODLAKE, CALIFORNIA

ON THE JOB . . .

Flame-Gouging Halves Dismantling Costs

FLAME-GOUGING has been used with profit, lately, for dismantling welded structures such as refinery, natural-gasoline, and chemical-plant pressure vessels, storage tanks, and pipelines. Since with this process the operator can cut to close tolerance without damaging the base metal, parts salvaged by gouging normally can be reused with little or no preparation. That flame-gouging is also speedy and easy to use is illustrated by the typical dismantling job described here.

Tank construction . . . Two incomplete oil-storage tanks of 80,000-bbl. capacity were purchased for reerection at a refinery. These tanks were of similar construction, each with a floor of ¼-in.-thick by 8-ft.-wide rectangular plates, varying from 10 to 30 ft. in length. Floor plates had been laid out and lap-welded to form a rough circle about 110 ft. in diameter. A ring of ⅜-in.

Choose the one that fits your needs...both types are made to **REED** *Standards of Quality*

Left: The **REED** 2CWW Twin-Blast Rock Bit is an outstanding hard formation rock bit. It gives good footage and straight, full gauge hole in hard, abrasive formations such as chert, quartzite, hard limestone, etc.

Right: The **REED** Barracuda Two-Cutter Rock Bit gives fast penetration rates in the softer formations. It is also widely used in steeply dipping formations because of its excellent straight hole characteristics.

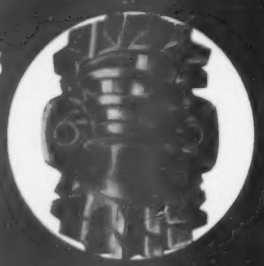
These are only two of the many bits **REED** has designed to help you drill faster. See the other side of this insert for more.

REED ROLLER BIT COMPANY

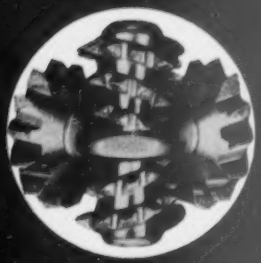
HOUSTON 1, TEXAS

One of these **REED** twin-blast **ROCK BITS** will do a good job drilling the next formation you encounter . . .

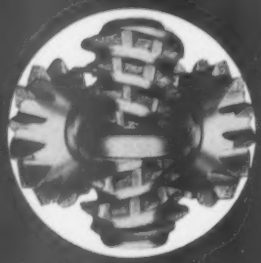
Ask your **REED** representative for suggestions. He can often help you reduce drilling costs.



REED Barracuda Bits are available in either of the two types shown. Type B-1 has spiral teeth on the long cutter and type B-2 has axial teeth. Either type may be used according to the preference of the operator.

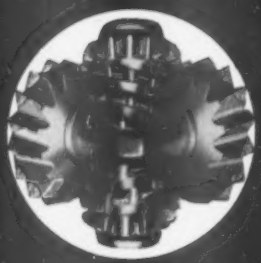


For fast penetration of top hole and unconsolidated formations.

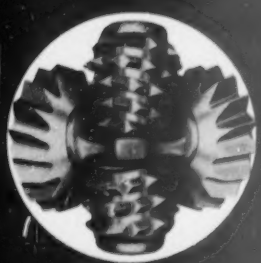


For drilling top hole and unconsolidated formations which are not exceptionally abrasive.

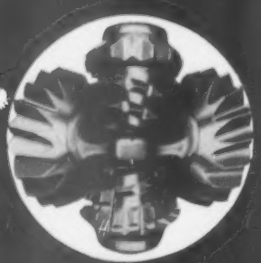
For relatively non-abrasive formations such as shale, salt, red beds, soft limestone.



For penetrating soft formations that are interspersed with streaks of abrasive sands and shells.



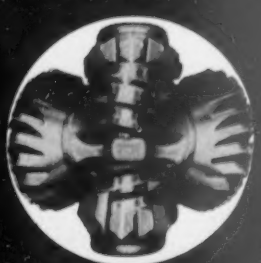
For medium formations such as chalk, gypsum, anhydrite, etc., where penetration is 10 to 25 feet per hour.



For medium hard formations where abrasive materials are encountered.

For moderately hard formations where a rate of penetration of 5 to 12 feet per hour is expected.

For heavy weight drilling of hard, abrasive formations like hard lime, chert, granite, and hard sands.



For drilling extremely abrasive formations with a high compressive strength.

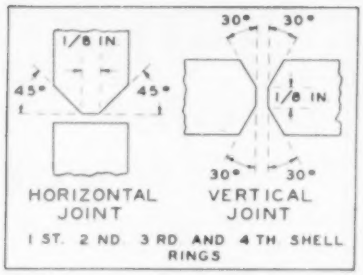
For very hard and abrasive formations such as chert, hard lime and dense abrasive sands.

For full gauge drilling of the hardest, most abrasive formations, where penetration is 1 to 5 feet per hour.

For chert, pyrite, granite, dolomite and quartzite, where maximum abrasion resistance is required.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS



Vertical edges of all plates in the first four rings are double-beveled 45° to a ⅛-in. nose. On second, third, and fourth ring plates, upper horizontal edges are square cut while lower edges are double-beveled 45° to a ⅛-in. nose.

"sketch" plates had been welded to the outer edge of the floor assembly to support the shell rings.

Completed shells for this type tank consist of six rings, each made up of 12 welded steel plates, 8 ft. wide by 31 ft. 6 in long. Plate thickness varies from ⅜-in. for the bottom ring to ¼ in. for the top. Likewise, design of horizontal joints between shell rings varies. Both horizontal edges of plates making up the first or bottom rings are square cut. On the second, third, and fourth ring plates, the upper horizontal edges are square cut while the lower edges are double-beveled 45° to a ⅛-in. nose. Vertical edges of all plates in the first four rings are double-beveled 30° to a ⅛-in. nose. All four edges of plates making up the fifth and sixth rings are square cut.

One of the tanks to be salvaged consisted of a completed floor assembly with one shell ring erected. Four rings had been erected on the second tank, but only vertical welds and inside roundabout welds had been completed on the first three shell rings. The fourth ring had been only step-welded.

Salvage procedure . . . Oxweld No. 19 gouging nozzles were used at recommended pressures for removing horizontal welds between shell rings. As dismantling proceeded, operators developed a weaving motion of the blowpipe which removed the weld metal, leaving the square edges of lower plates virtually untouched, while edges of upper plates were J-grooved. Gouging speeds for this phase of the work ranged from 30 to 60 ft. per hour.

Because vertical seams had already been welded front and back, it would have been difficult to match the line of gouge exactly on both sides. To overcome this, a cutting blowpipe equipped with standard nozzle was used to make a square cut through the center of the weld. Then the edges of this cut were U-grooved by flame-gouging with the No. 19 gouging nozzle while the plates were still in place. The bottom ring was removed from the floor by making a square cut through the plate at the top of the weld.

On the lap-welded floor plates, it was necessary only to separate the plates rather than to remove all of the weld metal. For this operation, gouging speeds of 125 to 175 ft. per hour were obtained by using a No. 25 gouging nozzle with the spud removed. After dismantling, all plates were moved to the new location and reerected without further preparation. Floor plates were simply turned over to avoid the necessity of matching welds.

Time and materials . . . This entire dismantling job involved the removal of 4,020 lineal feet of lap welds, 754 lineal feet of horizontal welds, 384 lineal feet of vertical welds, and 754 lineal feet of floor to shell welds. The total of 5,922 lineal feet of weld metal was removed at an average over-all speed of approximately 57 ft. per hour, and required 3,400 cu. ft. of acetylene and 14,000 cu. ft. of oxygen. According to the contractor who did the job, the cost of dismantling by this procedure amounted to less than half that of making square cuts through all welds and rebeveling the plates.

KOHLER ENGINES

4-CYCLE
AIR-COOLED

K90

K160

K90 3.6 H.P.
K160 6.6 H.P.
K330 12.0 H.P.
K660 26.8 H.P.

Kohler Engines are engineered and manufactured to the high standards which have made the Kohler mark known for quality the world over.

Power for garden tractors, pumps, sprayers, snow removal equipment, grain elevators, hoists, portable saws, concrete mixers, compressors, industrial lift trucks.

Write for information

K330

K660

Kohler Co., Kohler, Wisconsin
Established 1873

KOHLER OF KOHLER

PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS
AIR-COOLED ENGINES • PRECISION CONTROLS

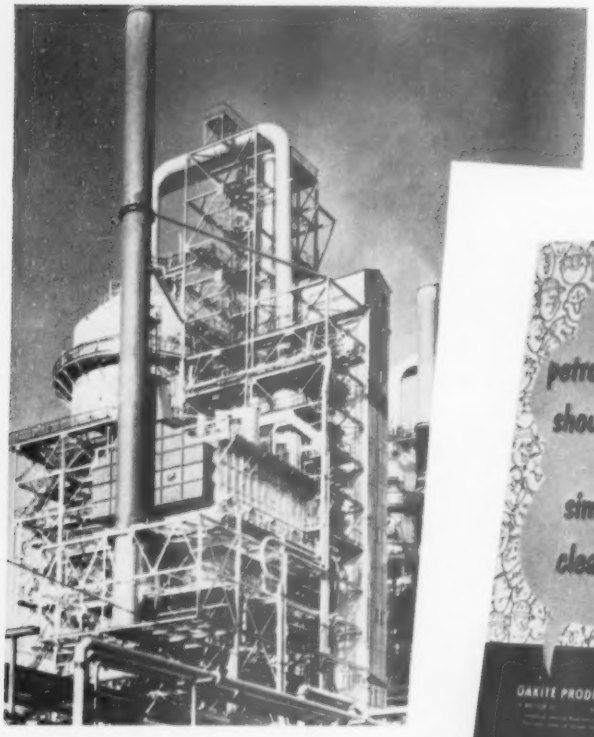


Photo Courtesy Standard Oil Co. (N.J.)

Fits right into your Processing Picture

If you want a clear, more complete picture of Petroleum maintenance cleaning, send for this FREE 48-page handbook. It contains such valuable information as:

- Heat exchanger cleaning methods
- Salvage cleaning
- Storage Tank maintenance, stripping, cleaning, preparing for re-paint
- Tank car cleaning with scientific Oakite Equipment
- Tower cleaning
- Rust prevention
- Steam-detergent cleaning methods
- Drum reconditioning
- Cleaning barge interiors

Plus pages of information on cleaning all processing equipment, large or small. Booklet is well illustrated, and contains a number of charts that explain fully the many time- and money-saving Oakite methods of handling tough cleaning operations. Write for your copy today. Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

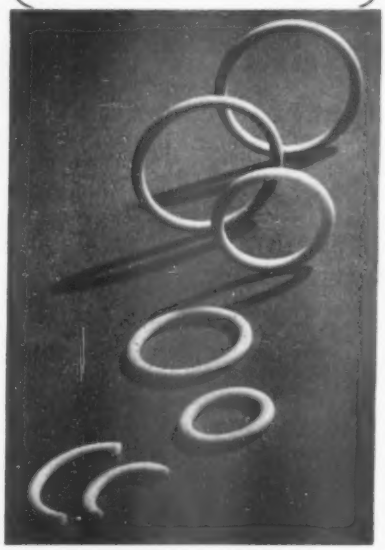
OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

"O" TEFLON RINGS

molded by DORE' for OIL INDUSTRY APPLICATIONS



● Inert to all commodities, TEFLON* "O" Rings are unaffected by acid, alkalies, hydrocarbons or soured crudes.

Molded by Dore', TEFLON "O" Rings are available in a wide range of sizes; are made to A-N specifications and tolerances. They have a low coefficient of friction - safe working temperatures from −90° F. to 350° F.

Dore' has developed a means for expanding "O" Rings for their installation in all standard "O" ring grooves—has research facilities for developing filled TEFLON "O" Rings for special applications.

Write us your "O" Ring applications — and we'll furnish TEFLON "O" Rings to meet them.

*TEFLON is E. I. du Pont's registered trademark for Tetrafluoroethylene resin.

John L. Dore', Co.

SALES AGENTS IN U.S.A. FOR JOHN L. DORE, INC.
MOLDERS OF "TEFLON" AND "KEL-F" SHAPES
P. O. BOX 7772 • HOUSTON 7, TEXAS

EQUIPMENT MEN
. . . in the News

Roots-Connersville Celebrates Hundredth Anniversary

Roots-Connersville Blower, a division of Dresser Industries, Inc., this year is celebrating the 100th anniversary of the discovery by the Roots brothers, Francis and Philander, of a principle for creating positive mass movement of gas and air that has remained basically unchanged since 1854. It was in that year that the first Roots industrial blower was made.

R. R. NEWQUIST

The list of American companies 100 years old is growing steadily. However, only a few, if any, can lay claim to producing the same basic product they started with. Rarely does an original idea prove sound enough to keep pace with 100 years of rapid industrial growth and still remain as good as the day it was conceived.

Improvements have been made in housing, bearing, mechanical details, and in the metals contained in the machines. The principle of counter-revolving impellers machined to a tolerance that brings them close enough to carry air with minimum loss but not close enough to touch each other or the casing that houses them has remained the same.

The brothers made blowers as a sideline to their principal business at their woolen mill. Their machines proved so successful, it was not long before they concentrated on blowers and abandoned the woolen mill as their main pursuit. As early as 1867 the Roots principle for positive blowers received international recognition. Their blowers were given the highest award for machinery of that class at the Paris Exposition.

Present status of Roots-Connersville Blower as a division of Dresser Industries was achieved after a succession of changing ownerships and mergers.

Original builders of Roots blowers, of course, were the Roots brothers who operated under the name P. H. & F. M. Roots Co. In 1893, though, a Roots engineer, John T. Wilkin, had an idea for an improvement and took out a patent. He broke away, obtained financial backing, and formed Connersville Blower Co.

The two firms operated as competitors, both at Connersville, Ind., until 1929. In this year both firms were purchased by an Ohio syndicate. They were operated separately but were under control of Stacey Engineering Co.

In 1931, Stacey Engineering merged with International Derrick & Equipment Co., Columbus, Ohio. Under this administration, P. H. & F. M. Roots Co. and Connersville Blower Co., still operating as separate units, were merged.

The final change in ownership came in 1944 when Dresser Industries, Inc., Dallas, acquired control to round out its services to the oil and gas industry.

The Roots brothers, Philander and Francis, who evolved the Roots principle for rotary positive blowers that has remained basically unchanged for a century.

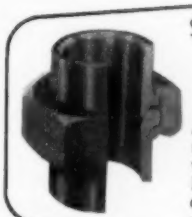
Now, in addition to the rotary positive blower, the company makes centrifugal blowers and exhausters, positive displacement meters, vacuum pumps, inert gas generators, and the Spiraxial compressor.

As for the future, Ralph R. Newquist, company president, has this to say: "The present management of Roots-Connersville Blower Division has had some pretty high marks set for it if it is to achieve and maintain the greatness established in a century of operation. We have set a determined path for ourselves which will lead to even greater success in the future. It is our feeling that there still remains a tremendous field of applications for our product. We intend to fully explore that field and continue to round out our service to industries using gas and

Catawissa
PERFECT SEAL
Unions

HOT FORGED from solid, rectangular steel bars, designed and produced for dependable, long-life service under the severest piping conditions!

A TYPE FOR EVERY USE!
FOR ALL PRESSURES!
FOR ALL TEMPERATURES!



Standard & Double Extra Heavy
UNIONS
Available with screwed or socket weld ends. 3000-lb. sizes ⅛" to 3"; 6000-lb. sizes ⅛" to 2".

ORIFICE UNIONS
With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

MALE & FEMALE UNIONS
With steel-to-steel, bronze-to-steel, stainless steel-to-steel or orifice seats. 3000-lb. service only.

Standard & Double Extra Heavy
LUG NUT UNIONS
Hammer-type for quick opening and quick closing.

Write for your free copy of catalog 11 for complete information

CATAWISSA VALVE AND FITTINGS COMPANY
450 Mill St. • CATAWISSA, PA.

HEAT UP STEAM UNITS IN 1/8 THE TIME WITH Heat-Kwik

Super-Silvertop Steam Traps

Interested in getting more production out of your steam-consuming units? Then equip them with the new Heat-Kwik Super-Silvertop Steam Traps. One of the most important steam trap developments in our times, Heat-Kwiks heat up units in 1/8th the time of ordinary inverted bucket traps . . . three times as fast as so-called air eliminator or blast type traps. Everywhere users are adopting these phenomenal traps as the answer to fast heating up, more production, and lower steam consumption. You, too, can save money by standardizing on Heat-Kwiks. See your Super-Silvertop distributor or mail coupon for further information.

SUPER-SILVERTOPS...
Quality Steam Traps Since 1886

The V. D. ANDERSON Company
1981 West 96th Street • Cleveland 2, Ohio
Please send me a copy of your Bulletin 1153 describing Heat-Kwik Steam Traps.

Name_____Title_____

Address_____

City_____State_____

ANDERSON

air with our expanded line of equipment."

Matson Sent to Magnolia By McCullough Tool Co.

W. J. MATSON

W. J. Matson has been appointed sales engineer assigned to McCullough Tool Co.'s Magnolia, Ark., branch, according to O. J. McCullough, vice president.

Matson's previous oil-field experience includes 8 years with Woodley Petroleum, 6 years with The Cavins Corp., 2 of those years as district manager. He was also in the oil-well service business for himself for a period of 1 year. For the past 12 months he has been with McCullough Tool Co. as an operating engineer.

M. K. Nolan to Manage Meek's Houston Office

M. K. (Ken) Nolan, Houston, has been promoted to manager of the Houston office of J. R. Meek Co., Tulsa, Mid-Continent oil field representative for Young Radiator Co., Racine, Wis., and Mattoon, Ill.

In his new responsibilities, Nolan will continue to headquarter in Houston. He will handle sales and engineering of Young oil-field and heat-transfer equipment in Texas, Louisiana, and New Mexico.

Nolan joined Meek in 1950 after several years of successful engineering practice.

Pritchard of California Promotes C. F. Shortal

Chester F. Shortal has been named manager of the newly opened Kansas City district sales office of J. F. Pritchard & Co. of California, serving western Missouri and Kansas. Shortal has been with Pritchard since 1951.

It was also announced that W. R. Roeyer has joined the company as manager of cooling-tower and heat-exchanger sales.

The company, a subsidiary of J. F. Pritchard & Co., is engaged in the manufacture of process vessels for the petroleum industry.

Midwestern Appointed Keystone Distributor

Midwestern Engine & Equipment Co., Inc., Tulsa, has been named national distributor for Keystone Roofing Manufacturing Co., Windsor Park, York, Pa.

Midwestern will distribute the complete line of Keystone asbestos pipeline felts through its Tulsa and Oklahoma City offices, and through its sales representatives in Houston, Pittsburgh, Atlanta, and Mount Prospect, Ill.

Continental Elects Brewer To Supervisory Post

R. BREWER

Richard Brewer has been elected vice president and supervisor of Continental Geophysical Co., Fort Worth, according to A. E. McKay, president. Brewer, who joined Continental Geophysical in March, formerly was district seismic supervisor for Atlantic Refining Co., in Shreveport.

Previously, Brewer served as assistant seismologist for Shell Petroleum Corp. in Louisiana, Texas, and New Mexico, from 1936 till 1942. In 1946, Brewer was employed by Atlantic Refining Co. as assistant to the district supervisor for Atlantic's Southwest Texas district.

Lane-Wells Names O'Haver To Mid-Continent Post

M. P. O'Haver, formerly Rocky Mountain district superintendent of Lane-Wells Co., has been appointed assistant division operating superintendent of the Mid-Continent division and transferred from Casper, Wyo., to Oklahoma City.

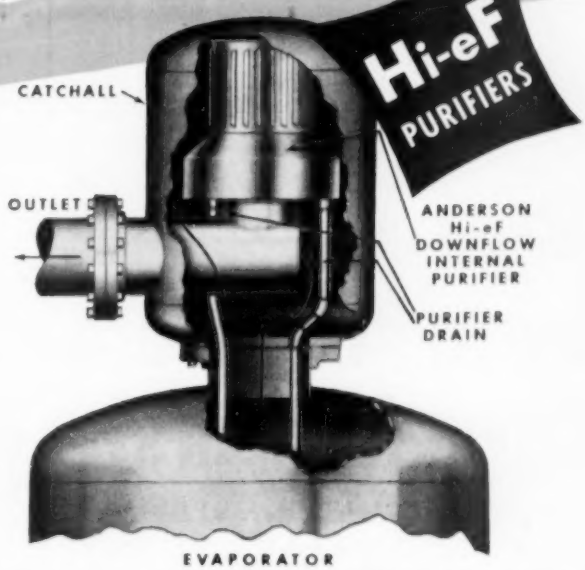
J. F. Alexander, formerly assistant to the division operating superintendent, Mid-Continent division, has been promoted to Rocky Mountain district superintendent in Casper.

Donald R. Kirchner, formerly gun-perforator operator at Perry, Okla., has been appointed district sales engineer trainee at Russell, Kans.

New Marketing Firm Headed By Lundquist, Dowell

A new petroleum and petrochemical products marketing firm has been organized in Tulsa by Harry M. Lundquist and Martin L. Dowell. With offices in the Wright Building, the firm, Lun-Dow Co., will specialize in the conversion of industrial plants to L.P.G.

Control TROUBLESOME CARRYOVER IN EVAPORATORS, STILLS AND TOWERS WITH Hi-eF PURIFIERS



EVAPORATOR

Carryover represents an economic loss to your plant. Scientifically engineered Hi-eF Purifiers prevent this loss . . . stop carryover from leaving fractionating columns, bubble cap towers, packed towers, stills and similar equipment. Installed inside the vessel or in the line near it, Hi-eF Purifiers recover 99% of all solids from vapors and gases which:

1. **Permit towers to be operated at greater capacities.**
2. **Prevent valuable solids from leaving the process vessel.**
3. **Stop contamination of subsequent processes with guck, solids, etc.**
4. **Avoid contamination of distillate and other products and processes with foreign entrainment.**
5. **Increase operating efficiency of process equipment.**

Designed by America's leading separator engineers, Hi-eF Purifiers are unequalled in their efficiency. They are stationary, maintenance-free and filterless, and embody new multi-stage baffle and centrifugal separation design. Mail coupon for further details.

Hi-eF Purifiers

THE V.D. ANDERSON COMPANY
1992 West 96th Street • Cleveland 2, Ohio

Please send me a copy of Bulletins describing your purifiers for the petroleum industry.

Name ..... Title .....
Company .....
Address .....
City ..... State .....

Recover Solids in Vessels—Keep Dirt and Moisture out of Steam and Air Lines

How to Keep Brush Down for Years!

Use Du Pont AMMATE® Weed & Brush Killer—Has Minimum Drift Hazard

Controls Brush but Lets Grass Come Back Quickly to Resist Erosion

Industrial users of "Ammate" Weed and Brush Killer say that when the original spray job is done well, brush is kept under control with nothing more than an occasional spot spray years later.

Even where right-of-ways adjoin sensitive crops, like cotton, you can rely on "Ammate" to do the job safely. That's because it's not volatile—reducing spray-drift damage to a minimum.

This year, be sure to include "Ammate" in your brush-control program. It's ideal on power, telephone pipe-line and railroad right-of-ways—wherever you have a brush problem.

Free illustrated booklet describes how to control brush in right-of-ways with Du Pont "Ammate." For your copy, write Du Pont, Grasselli Chemicals Dept., D-4026, Wilmington, Delaware.

Ammate®

Weed and Bush Killer

DU PONT

REG. U.S. PAT. OFF.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

W&T Sensitive SURVEYING ALTIMETER

READABLE TO ONE FOOT

W&T Altimeter Surveying saves time and money by eliminating lines of sight.

RANGES:
—1000 to 3000 FT.
—1000 to 6000 FT.
—1000 to 15000 FT.

Write today for additional information. A-100

WALLACE & TIERNAN
PRECISION INSTRUMENTS AND ELECTRICAL MECHANISMS
Belleville 9, N. J.
In Canada: Wallace & Tiernan Products Ltd. • Box 54, Toronto 13

50 years in the making

BLACKMER'S "Gold Seal" TRUCK PUMP

Long life and economical operation is assured **BLACKMER'S** customers with a new design which represents 50 years of experience in building the famous Rotary Pumps which are,

"SELF-ADJUSTING FOR WEAR"

The new design incorporates all of the time tested **BLACKMER** features plus:

The BLACKMER CARTRIDGE-TYPE *Mechanical Shaft Seal. Heavy Duty Anti-friction Bearings completely protected from the pumpage.*

Available in two sizes, 2½" and 3", rated at 100 GPM and 200 GPM respectively. "Listed by Underwriters' Laboratories, Inc."

Write for complete details.

BLACKMER *liquid materials handling*

BLACKMER

Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves
BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.
DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO
See Yellow pages for your local sales representative

systems both for standby and primary fuel sources.

Lundquist helped organize Iverson Tool Co., of Tulsa, in 1926, and was secretary-treasurer of the firm until he sold his interests in 1949. He is also associated with Rogers & Lundquist Pipe & Supply Co., of Tulsa.

Dowell formerly was with Uni-Chem, Inc., a division of Universal Petroleum Co., and previous to that was in the chemical plants division of Blaw-Knox Co.

Larkin Names Alexander as Vice President, Sales

T. E. ALEXANDER

T. E. Alexander was elected vice president in charge of sales for Larkin Packer Co. at a recent directors' meeting. The other officers of the company, all of whom have served since 1944, are as follows: W. H. Larkin, president; J. J. Larkin, Jr., executive vice president; and B. J. Jostrand, secretary-treasurer.

Alexander joined Larkin as a field representative in 1937 in Corpus Christi, moved to Houston in 1940, and soon after was appointed district manager in charge of the company's Gulf Coast operation. In 1946 he was advanced to sales manager. In his new capacity he will continue to direct the sales, both domestic and export, from his headquarters in Houston.

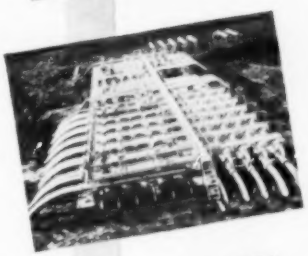
Before joining Larkin, Alexander was with Wynne Drilling Co. His oil-industry experience covers both field and sales work in the Gulf Coast, Mid-Continent, and foreign fields. From 1929 to 1951 he was in Aruba for Lago Oil & Transport Co.

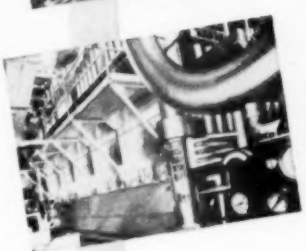
Heuser Elected President Of Engine Institute

J. E. HEUSER

J. E. Heuser, engine division sales manager of Le Roi Co., subsidiary of Westinghouse Air Brake Co., was elected president of Internal Combustion Engine Institute at its annual meeting.

Other officers elected were: Vice president, B. G. VanZee, chief engineer, Minneapolis-Moline Co.; secretary, H. W. Smith, consulting engineer, engine division,





with a coat of
ALUMINUM Paint

The flakes in aluminum pigments when made into an Aluminum Paint *overlap* in parallel layers in the paint film. This action, a result of "leafing," gives many outstanding properties to the Aluminum Paint.

It is this coat of protecting metal which provides the great durability, resistance to moisture, heat and fumes, reflectivity to light and heat of the sun and maximum hiding capacity—all of which are inherent in good Aluminum Paint.

You improve, protect and safeguard your buildings and equipment when you paint with Aluminum. As one of the largest suppliers of aluminum pigments to paint manufacturers, you can be doubly assured of long-life, low cost protection when you purchase Aluminum Paint formulated with MD Aluminum Pigments.

Send for your copy of the new ALUMINUM PAINTING HANDBOOK. It is filled with ideas and uses for Aluminum painting of industrial buildings and equipment.

MD
METAL POWDERS
METAL PIGMENTS
METAL ABRASIVES
Since 1916

METALS DISINTEGRATING COMPANY, INC.
Elizabeth B, New Jersey
Plants: Elizabeth, N. J., Manchester, N. H., Berkeley, Calif., Emeryville, Calif.

WORLD'S LARGEST MANUFACTURER OF FINELY DIVIDED METALS

What one tube steel will give you the best life/cost ratio? *Ask the experts!*

This month's report is on: **DM STEEL**

Has unusually high creep strength for a pearlitic steel, good stability up to 1200°F., fairly good corrosion and oxidation resistance. Has 2 to 3 times the life of carbon steel where corrosion is not severe. Recommended for cracking furnace tubes, hot oil lines, superheater tubes, high temperature steam piping and forgings for accessory parts.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2¼	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

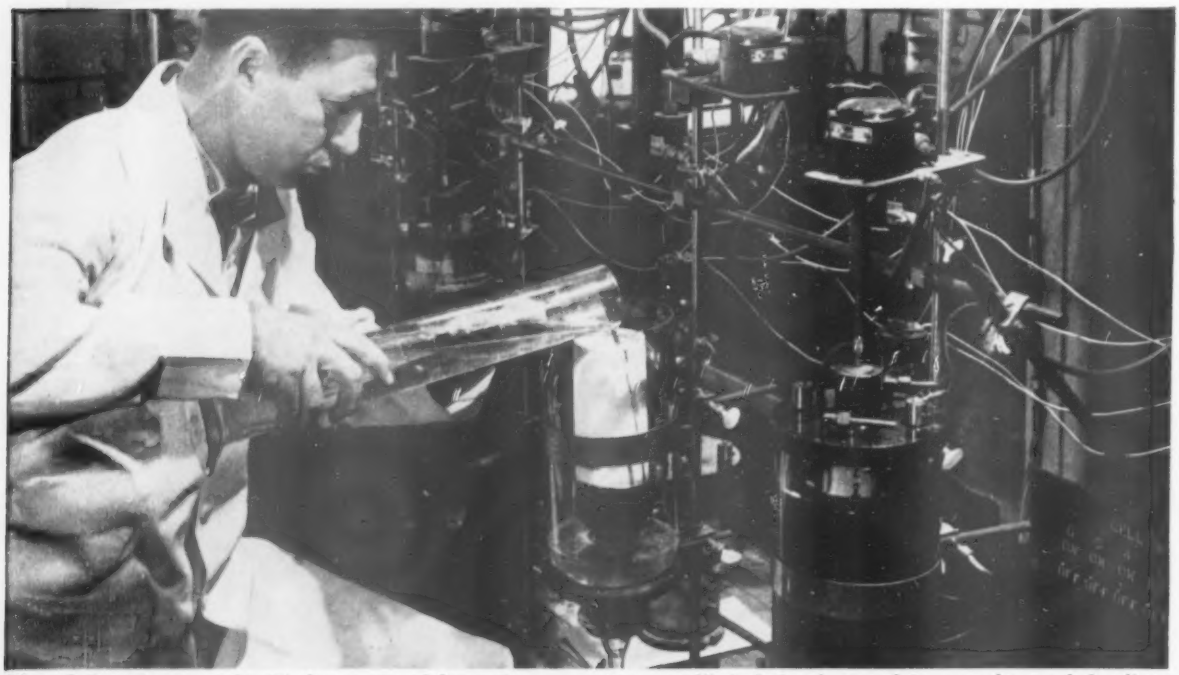
**Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

THERE are probably several high temperature tube steels that will solve your heat, pressure, corrosion and oxidation problems. But there's only one analysis that will give you maximum tube life per dollar.

To find it, *ask the experts!*

With over 20 years of steel research and experience, Timken Company metallurgists are recognized authorities on high temperature steels. They'll use this experience to help you select from 24 different analyses, pick the one tube steel that will give you the best life/cost ratio. And regardless which analysis you select, you'll be assured of uniform quality because the Timken Company rigidly controls quality from melt shop through final inspection.

Let the Timken Company's RSQ—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Electrolytic equipment used in Timken Company laboratories to extract non-metallic inclusions from steels in research on steel cleanliness

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN
Fine Alloy
STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Caterpillar Tractor Co.; and treasurer, J. D. Cook, secretary-treasurer, Hercules Motor Corp.

The institute is composed of major manufacturers of high-speed gasoline and diesel engines. Its member companies' manufacturing facilities represent an output of engines in excess of 100,000,000 hp. annually.

Chiksan Gives Schlarb Special Assignment

H. J. SCHLARB

H. J. Schlarb has been promoted to the newly created position of special representative in the sales department of Chiksan Co. and Chiksan Export Co., according to G. R. Winder, vice president and general sales manager. In his new capacity, Schlarb will maintain contact with customers and prospects, personnel of foreign operations, and he will handle special assignments and projects. The creation of this position was necessitated by the expanding volume of Chiksan's ball-bearing swivel joint business.

Schlarb has been with Chiksan over 9 years, and has had extensive experience with Chiksan products and their applications.

Pacific Pumps Boosts Weis

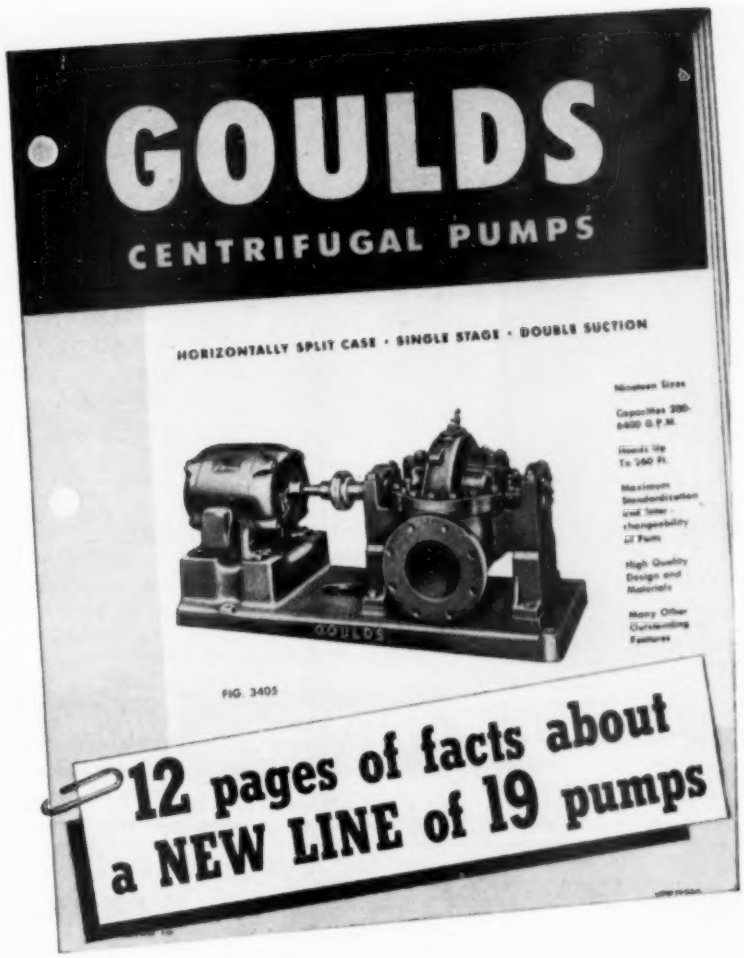
E. J. WEIS

Elmer J. Weis has been elected to the position of executive vice president of Pacific Pumps, Inc., Huntington Park, Calif. This announcement was made by Arthur R. Weis, president of the company. E. J. Weis has served Pacific for 30 years in various capacities, and was formerly vice president and director of sales.

Chicago Bridge Sends Campbell to Atlanta

Grover Campbell has been transferred from general sales office of Chicago Bridge & Iron Co. in Chicago to its Atlanta sales office, located in the Healey Building.

Campbell was graduated from Alabama Polytechnical Institute with a B.S. degree in mechanical engineering. He joined Chicago Bridge & Iron in 1948,


GOULDS
CENTRIFUGAL PUMPS
HORIZONTALLY SPLIT CASE · SINGLE STAGE · DOUBLE SUCTION
FIG. 3405
12 pages of facts about
a NEW LINE of 19 pumps

The quickest way you can really discover what the new Goulds Fig. 3405 centrifugal pump can do for you is to read the descriptive bulletin pictured above.

Here are some hints of what you'll find:

The quality of materials and extras of design that you have been able to get only by paying extra are *standard* on this new pump: stuffing box bushings, stainless steel impeller keys, Teflon water seal rings —to mention a few.

The Fig. 3405 carries interchangeability of parts far beyond anything we've been able to do before. Only three shaft and rotating parts assemblies (exclusive of impellers and wearing rings) provide for 19 pump sizes.

This means real spare parts inventory savings for any plant that uses many pumps. It also means easy-to-make field changes to meet new requirements.

We've come as close as modern design and materials allow to putting into this new pump what our industrial customers have told us they want. The 12-page illustrated bulletin tells you all about it. We'll be glad to send you a copy.

To get a copy of Bulletin 721.6, get in touch with the nearest Goulds representative or just fill in the coupon, pin it to your letterhead and mail it to us at your convenience.

Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC.
Dept. OG, Seneca Falls, N. Y.

Please send me 12-page information Bulletin No. 721.6 on the new Fig. 3405 centrifugal pump.

Name_____

Company_____

Street_____

City_____ Zone____ State_____

FOR SAFE AND DEPENDABLE MOTOR CONTROL

install ..... NELSON
COMBINATION STARTERS

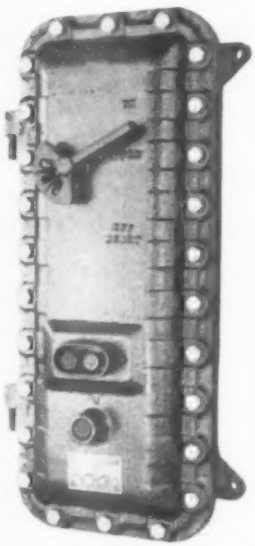
Nelson Size 2 Combination Motor Starter in water-tight and dust-tight cast iron enclosure.

The Nelson Combination Magnetic Motor Starter combines in ONE enclosure: (1) An air circuit breaker that serves as a disconnecting device and provides short circuit protection; and (2) A full voltage, across-the-line, 3-phase motor starter.

Motor overload protection is obtained with overload relays.

Starters can be furnished in explosion-proof (NEMA VII) enclosures for hazardous locations. Or, water-tight and dust-tight (NEMA IV and V) enclosures can be furnished.

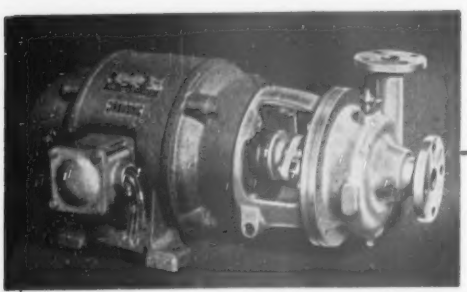
Write for descriptive bulletins.



Nelson Size 2 Combination Motor Starter in heavy duty cast iron explosion-proof enclosure. Note built-in control station.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131



A low-cost answer to many acid-pumping problems!

AMPCO* Centrifugal Pumps

Take the headache out of pumping acids — use Ampco Centrifugal Pumps. Made of Ampco aluminum bronzes, they have exceptional resistance to corrosion. And they also resist the damaging effects of cavitational erosion, deformation, and wear.

That's why Ampco Pumps are ideal for handling difficult liquids such as hot sulfuric acid, hot acetic acid, hydrofluoric acid, fatty acids — as well as dyestuffs, caustics, brine, and other corrosive liquids.

Best of all, Ampco Pumps *sell at standard pump prices* — even with all their extra advantages. They're available in sizes from fractional flow to 600 gpm — with close-coupled or pedestal mounting. Write for more information today.

AMPCO METAL, INC.
Department OG-4 • Milwaukee 46, Wis.
West Coast Plant: Burbank, California

Reg. U. S. Pat. Off. P 6

STANDARDIZE ON JENSEN PUMPING UNITS!

Profit-wise producers around the world have found it advantageous to standardize on JENSEN PUMPING UNITS. With 22 models to choose from, you are assured the model that fits your job—exactly! JENSENS have a 34-year field-proven record for profitable and trouble-free service. Investigate JENSEN Units now.

JENSEN

BROS. MFG. CO., INC., Coffeyville, Kansas
EXPORT OFFICE: 50 Church St., New York City

and worked at its Birmingham plant until 1953, and in the Chicago general sales office until his transfer.

In his new position he will assist M. G. Mitchell, manager, and J. W. Hoerner and B. J. Jenkins, contracting engineers.

Shuman Gets New Post at Fluid Packed Pump Co.

Sidney Shuman has been promoted to the position of executive vice president of Fluid Packed Pump Co., according to J. B. Reilly, president.

SIDNEY SHUMAN

Shuman, who has spent his entire life in the oil business, joined Fluid Packed Pump in 1936. Starting as a service man, he became a salesman and worked in the Gulf Coast, Mid-Continent, Eastern, and Northwestern fields. After serving the company for a number of years as Mid-Continent manager, he moved to California in 1945 to head an expanding sales program.

Fluid Packed Pump now maintains Oilmaster pump stocks and service facilities in over 100 domestic field stores with additional outlets throughout the oil producing world.

Patnik Receives Lincoln Dealer Sales Manager Post

Albert Patnik has been appointed to the newly created position of dealer sales manager by Lincoln Electric Co., Cleveland. He will have responsibility for the management of Lincoln dealer organization, through which Lincoln welding machines and electrodes are sold to smaller users. Lincoln services large industrial users of welding through its own staff of approximately 125 field engineers.

Patnik joined the Lincoln sales staff in 1940. He served as a field engineer in Los Angeles and Seattle districts. He was a regional dealer manager in

Whether you have a new concrete floor or are refinishing an old one, the Multi-Clean Method is fast and economical. It fortifies concrete against abrasion and the devastating effects of excessive water, grease, oils, alkali, soaps and other chemicals. It prevents concrete dusting, pitting and chipping . . . gives you a hardened, completely sealed floor in a wide range of permanent non-fading colors and natural. You'll get better service and greater safety with added beauty and longer life from your concrete flooring when you use The Multi-Clean Method.

MULTI-CLEAN cuts hours off maintenance time!

The Multi-Clean Method saves many hours of floor maintenance time. Sweeping is easier, more effective and wet moppings become less frequent. Periodic steel wool buffing loosens stubborn dirt and restores the finish.

IT'S ALL EXPLAINED

Every floor care problem is answered in this 44-page handbook, packed with valuable information about floors and how to maintain them for lasting results and at lower costs.

WRITE TODAY FOR YOUR COPY!

MULTI-CLEAN PRODUCTS, INC.

2377 Ford Parkway — St. Paul 1, Minnesota

MAIL COUPON TODAY!

Multi-Clean Products, Inc.
2277 Ford Parkway, Dept. OU-4, St. Paul 1, Minnesota

Gentlemen: I would like this handbook and information on: ☐ Floor Machine; ☐ Floor Scrubber; ☐ Vacuum Cleaner. I'm interested in The Multi-Clean Method for: ☐ Concrete Floors; _____ Floors.

Name _____

Address _____

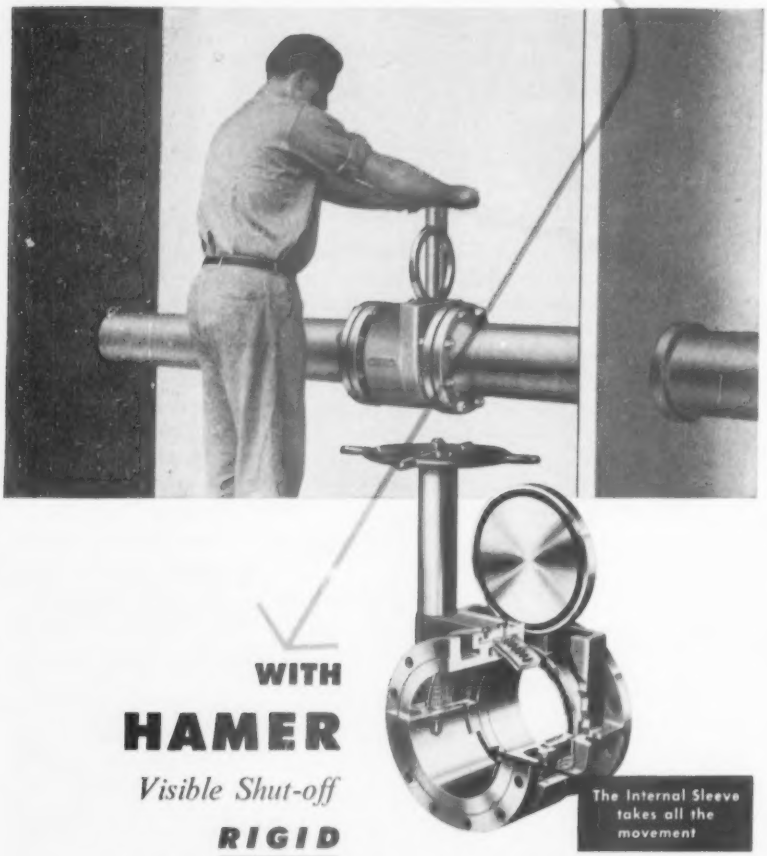
City _____ Zone ____ State _____

SEE MULTI-CLEAN IN ACTION—PLANT MAINTENANCE SHOW—BOOTH 1013

You can blind

RIGID *lines*

the speedy, cost-cutting way...



WITH

HAMER

Visible Shut-off

RIGID

LINE BLIND VALVES

HAMER *Plug Valves*

Thousands of users have proven the easy and immediate operation of HAMER plug valves. Will not stick or freeze.

Hamer "Rigid" Line Blinds solve the problem of blinding pipe lines where no endwise movement of the line is possible. An internal sleeve, actuated by ball-bearing ring gear, takes all movement. Rigid body is unaffected by misalignment or line strains. Enclosed plate slot prevents spillage— stops mess, fire hazard. Blind is easily opened, or closed by one man in one minute.

Send for free catalog.

HAMER OIL TOOL COMPANY

2919 Gardenia Avenue
Long Beach 6, California

Representatives throughout the United States

the Northwest territory from 1947 to 1949, and in 1949 was made district manager in Seattle. He was transferred to the home office in Cleveland to become rural dealer sales manager for the company in 1952, in which capacity he has served until his present appointment.

Hammond Names Walker to Southeastern Region

M. G. WALKER

The appointment of Max G. Walker as sales manager for the southeastern United States has been announced by Ralph E. Kramer, vice president in charge of sales for Hammond Iron Works, which specializes in design, fabrication, and erection of all types of steel plate structures.

Walker spent over 6 years as Chicago district sales manager for Murphy Diesel Co., of Milwaukee. He was also identified with construction activities in petroleum and mining industries of South America. He will make his headquarters at the new Hammond Iron Works plant at Birmingham, Ala.

Stone Joins Newman's

Boyd J. Stone has been made sales engineer for Newman's Inc., distributors of valves, flanges, and fittings. Stone attended University of California and Missouri School of Mining Engineering. He was formerly with Crane Co. and Tyler-Dawson Supply Co.

Republic Steel to Add to Seamless Tube Capacity

Republic Steel Corp. will increase the capacity of its South Chicago seamless tube mill by nearly 70 per cent with the addition of new facilities for rolling small size seamless tubing.

Work already has begun on the addition, and completion is expected in the spring of 1955. When the new facilities are in operation, capacity of the seamless tube mill will be increased from 186,000 tons a year to 312,000 tons a year.

The new facilities will produce oil-country tubing, bearing tubing, and pipe coupling stock.

A-C Tractor Division Makes Sales Appointments

F. L. Boyle has been appointed industrial sales manager, and Eugene Metcalf has been promoted to assist-

F. L. BOYLE

E. METCALF

ant industrial sales manager at the Dallas branch of the Tractor Division, Allis-Chalmers Manufacturing Co., according to A. E. Dorn, industrial sales manager of the Tractor Division, Milwaukee.

Boyle, who has been assistant industrial sales manager at Dallas, succeeds R. H. Windbigler who was transferred to industrial sales manager at the Kansas City branch. Boyle joined LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa, in 1948 and was a district representative at the time of its acquisition by Allis-Chalmers in 1952.

Metcalf started with Allis-Chalmers in the Dallas branch in 1947, and has been a member of the industrial sales department there.

Kaiser Steel Establishes Denver Sales Office

P. B. KLUTHE

Establishment of a sales office in Denver for Kaiser Steel Corp. was announced by C. F. Borden, vice president, sales.

Paul B. Kluthe will be Kaiser Steel sales representative in the new Denver office. Kluthe, prior to his newest assignment, was sales representative in the steel company's Mid-Continent district sales office in Tulsa.

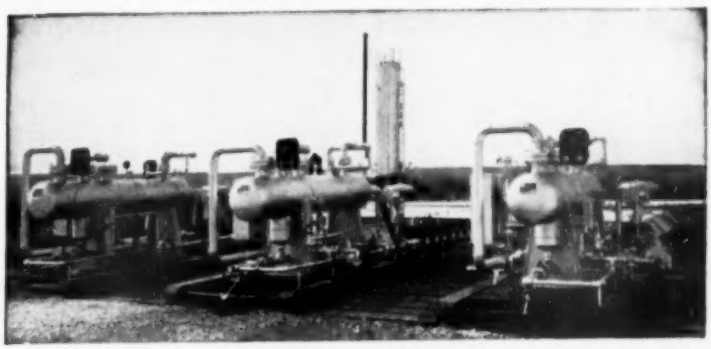
Homco Opens Casper Store

Houston Oil Field Material Co., Inc., has announced the opening of a new sales store in Casper, Wyo. A complete stock of oil-field supplies and equipment will be maintained.

Homco has maintained a complete service tool location in Casper for some time, and with the opening of the new supply store, can offer a com-

ROLO WELLCHECKERS

Permanent and Portable Separators for Metering Oil and Gas



This battery of three skid-mounted 4-5H-1607 Rolo Wellcheckers is one of five high-pressure installations with one of the major producers on the Gulf Coast. These units are arranged so that free water knockouts can be added at a later date by merely adding the controls.

Made in various sizes and working pressures to fit any operation, Rolo Wellcheckers separate the well fluid into three phases of oil, gas and water, and meter each accurately. This enables operators to check well production daily, and secure accurate tax and royalty records. Installations of this type are approved by regulatory bodies.

Write today about your well testing and oil metering requirements, and let us work with you on your problems. See Composite Catalog, or write for illustrated bulletin.

Crude Oil Metering Specialists

ROLO MANUFACTURING COMPANY

P. O. BOX 6763, HOUSTON 5, TEXAS

BRANCHES: Corpus Christi; Midland; Kilgore; Tulsa; New Orleans; Los Angeles; Bakersfield; Casper; Mt. Vernon, Ill.; Calgary (Alta.) Petroleum Industry Consultants, Apartado 3992, Caracas, Venezuela

EXPORT OFFICE: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y

plete oil-field service and supply to the oil industry in that area.

M. J. (Mutt) Caskey is district sales manager; I. P. (Woody) Woodard, store manager, and Walter J. Boulden, field salesman.

Walker is Sales Engineer For Setco Division

JOE G. WALKER

Joe G. Walker has been appointed as industrial sales engineering representative for Setco Division, Stromberg-Carlson Co., according to an announcement by W. W. Weedfall, general manager.

In that capacity, Walker will devote his time to communications problems in the oil, gas, and pipeline industries. He will give special attention to voice, teletype, and telemetry applications of carrier equipment, and will assist users in the integration of this type of equipment into regular communications systems.

Walker has been continuously associated with the communications and automatic switching industry since 1930.

Continental Changes Staff

The Continental Supply Co. has announced the following change in personnel. W. C. True, former store manager in Abilene, Tex., has been moved to the position of city salesman in that city. B. E. Wright, formerly of the Wichita Falls, Tex., store, has assumed the store manager's duties in Abilene.

Ladish Purchases Assets Of Tri-Clover Machine Co.

Ladish Co., Cudahy, Wis., has announced the acquisition of the assets of Tri-Clover Machine Co., Kenosha, Wis., by purchase of its capital stock.

Tri-Clover Machine Co., with plants in Kenosha and Cudahy and employing 350 people, will operate as a division of Ladish Co. No change in personnel is planned. Tri-Clover President Ferdinand Hinrichs, has been appointed a vice president of Ladish Co. in charge of the new division.

Founded in 1919, Tri-Clover pioneered in the development of high alloy and stainless steel light-weight corrosion resistant pipe fittings, valves, and pumps.

Ladish Co. manufactures carbon, alloy, stainless and nonferrous welding fittings and flanges, and forged steel fittings. Industries served include refineries, power plants, pipelines, chemical, petrochemical, and other industrial plants wherever fluids are handled. Founded in 1905 by Herman W. Ladish chairman of the board, the Ladish plant today covers 1,500,000 sq. ft. under roof.

Hawthorne, Inc. Announces Two Additional Dealers

Colorado Pump & Supply Co., Denver, and A-D Machinery Co., Elko, Nev., have been appointed authorized dealers for Herb J. Hawthorne, Inc., Houston, manufacturers of Blue Demon exploration drill bits.

These appointments will provide additional supply outlets to the rapidly expanding western exploration areas. To keep replaceable-blade rock-cutter bits continuously available in every active exploration area, Hawthorne's supply stock points now include 21 authorized dealers and export facilities to serve international fields of operation.

Oil Center Names Simms To East Texas Area

J. L. SIMMS

J. L. Simms has been made a new sales representative for Oil Center Tool Co.'s East Texas area, according to John Maher, president. Simms will work out of the Houston office.

Simms was a salesman for National Supply Co. for 5 years before joining O-C-T.

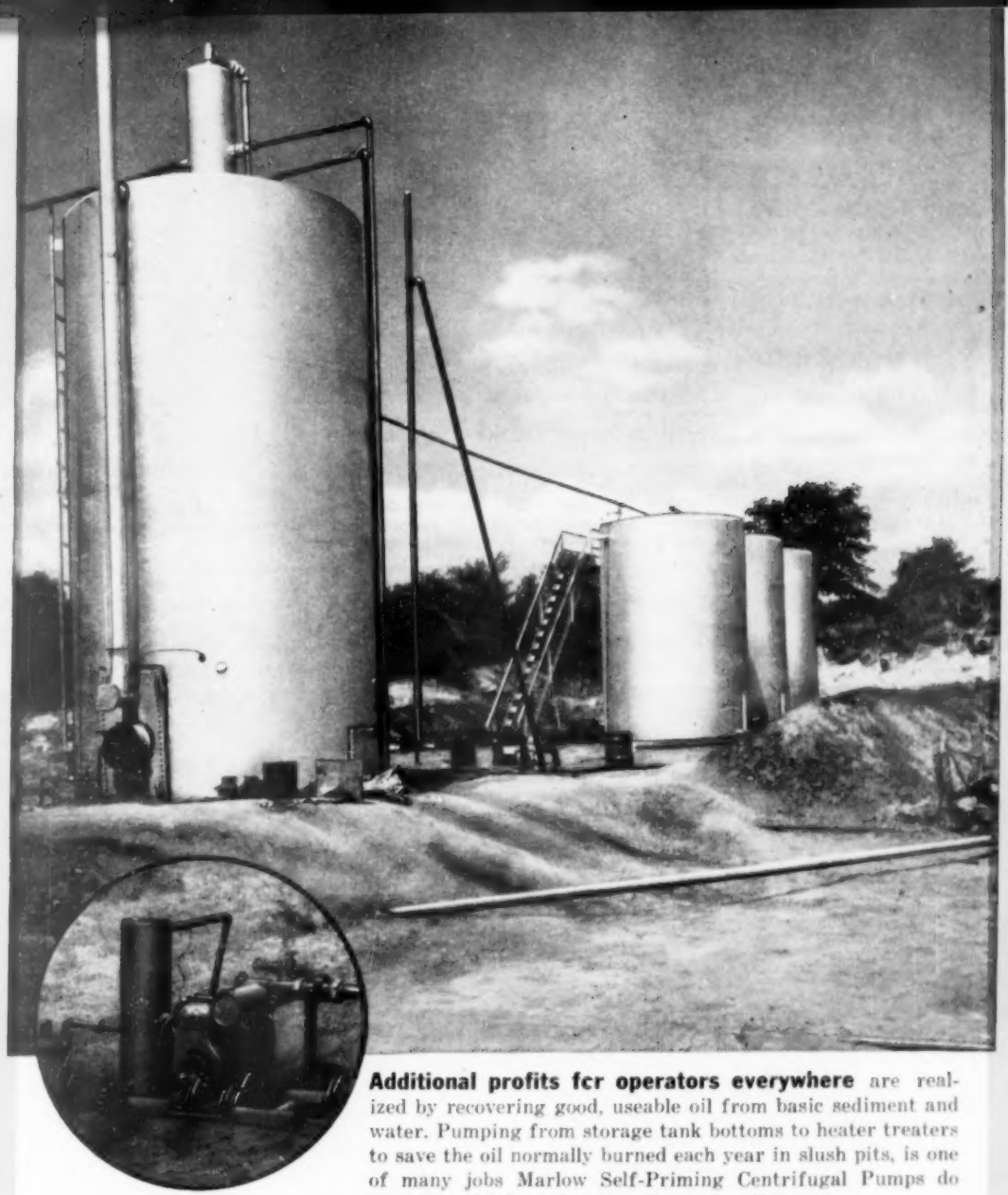
Standard Products Made Parker Distributor

The appointment of Standard Products, Inc., Tulsa, as distributor for Parker O-rings, has been announced by D. A. Cameron, sales manager for The Parker Appliance Co., Cleveland.

The new distributor will have available the services and technical assistance of M. L. (Jack) Sheenhan, Parker sales engineer in the northern Texas and Oklahoma region.

Stansbury, Inc. Names McEwen Vice President

John McEwen has been appointed vice president of Stansbury, Inc., Bakersfield, Calif., by M. H. (Curly) Stansbury, president. Stansbury, Inc., is broadening its services to the drilling and producing industries. New



Additional profits fcr operators everywhere are realized by recovering good, useable oil from basic sediment and water. Pumping from storage tank bottoms to heater treaters to save the oil normally burned each year in slush pits, is one of many jobs Marlow Self-Priming Centrifugal Pumps do quickly and efficiently throughout the oil country.

marlows are durable!

Marlow Self-Priming Pumps and Marlow "Mud Hog" Diaphragm Pumps make a team that can't be beat for tough oil-country pumping jobs. Marlows have proved their durability for majors and independents alike on rugged trouble-free service. Veteran oil men are making Marlow their first choice for long, dependable service. Make sure with Marlow . . . get the facts from your Marlow dealer or write for Bulletin O-53.

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

services include Ideal Gammaloy survey collars, Quick-E thread protectors, and Hillman-Kelley power tong service.

McEwen was for a number of years vice president and general manager of California division of Ideco. He was also chief engineer for Lee C. Moore Corp., and has a broad experience in oil-field equipment and services.

Four Engineers Added to Reliance District Offices

The addition of four application engineers to the Atlanta; Houston; Toledo, Ohio; and Rockford, Ill., sales offices of Reliance Electric & Engineering Co., Cleveland, has been announced by C. V. Gregory, manager of district sales.

These Reliance engineers who have already assumed their new assignments are: Arthur J. Stockslager, Atlanta district sales office, who reports to Emory G. Orahood, southeastern district manager; Walter A. Thorne, Houston district sales office, reporting to F. A. Denison, southwestern district sales manager; R. C. Marchant, Toledo branch sales office, who reports to William C. Mitchell, Toledo branch manager; and Don S. Follett, Rockford branch sales office, reporting to Dale D. Drollinger, Rockford branch manager.

Stockslager joined Reliance in 1953. He is a graduate in mechanical engineering from Duke University and a member of A.S.M.E.

Thorne also joined Reliance in 1953, bringing with him engineering background from Canadian Comstock Co., Ltd. He is an electrical engineering graduate of University of Toronto and Harvard Graduate School of business administration.

Schlumberger Holds Management Conference in Houston

Schlumberger Well Surveying Corp. recently held its annual management conference in Houston. The conference was attended by area and division managers from the United States and Canada, and by staff members of the engineering and research departments. Main subjects discussed included: field operation and equipment problems, new engineering developments, the sale of services, and personnel requirements.

Marchant joined Reliance in June 1953 upon graduation from Cornell University where he received his degree in electrical engineering and industrial electronics.

Follett joined Reliance shortly after graduation from Cornell University a year ago where he received his degree in mechanical engineering. He is also a member of A.S.M.E.

Maintenance Engineering Makes Naylor Chairman

C. E. Naylor was elected to the office of chairman of the board of Maintenance Engineering Corp, Houston, and W. J. Peddie was elevated to the position of president of the company at the thirteenth annual directors' meeting held recently.

Other officers, reelected at the meeting are: W. B. Rawson, vice president; A. J. Hooper, vice president; C. W. Gautier, vice president and secretary-treasurer; and E. B. Haldeman, assistant secretary and treasurer.

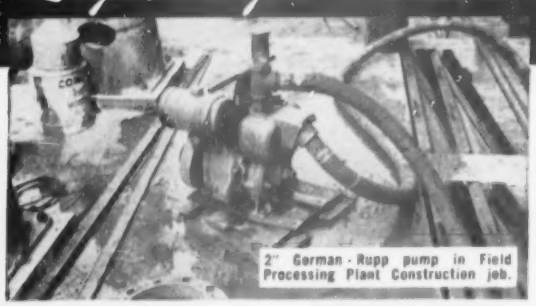
Following a series of expansions through the years, the firm now occupies quarters whose complete warehouse and office space totals 94,200 sq. ft., more than 2 full acres under roof.

Hohnholt is New Manager Superior Boiler Division

Frank F. Hohnholt has been named manager of Superior Combustion's water-tube steam generator division, according to executive offices in New York City.

Hohnholt, who started in his new position last month, has had wide experience in the engineering and sale of packaged boilers. He was formerly manager of package generator sales for Foster Wheeler Corp.

HIGH CAPACITY
Lightweight PUMPS



***QUICKEST* PRIMING — *HIGHEST* PRIMING**
FASTEST* PUMPING — *NON-CLOGGING!

Built for hard service. Five years without repair — three months' continuous runs without shutdowns are not uncommon. Saving in time alone repays their cost to many users in the petroleum industry. Lightweights range in size from 5,500 to 18,000 G.P.H.

Ask for bulletin 7-LW 13

Mid-Continent and Gulf Coast Oilfield Representative

HENRY H. PARIS DISTRIBUTOR, INC.
1125 ROTHWELL STREET, HOUSTON, TEXAS

A COMPLETE LINE OF CENTRIFUGALS IS AVAILABLE UP TO 240,000 G.P.H. CAPACITY.

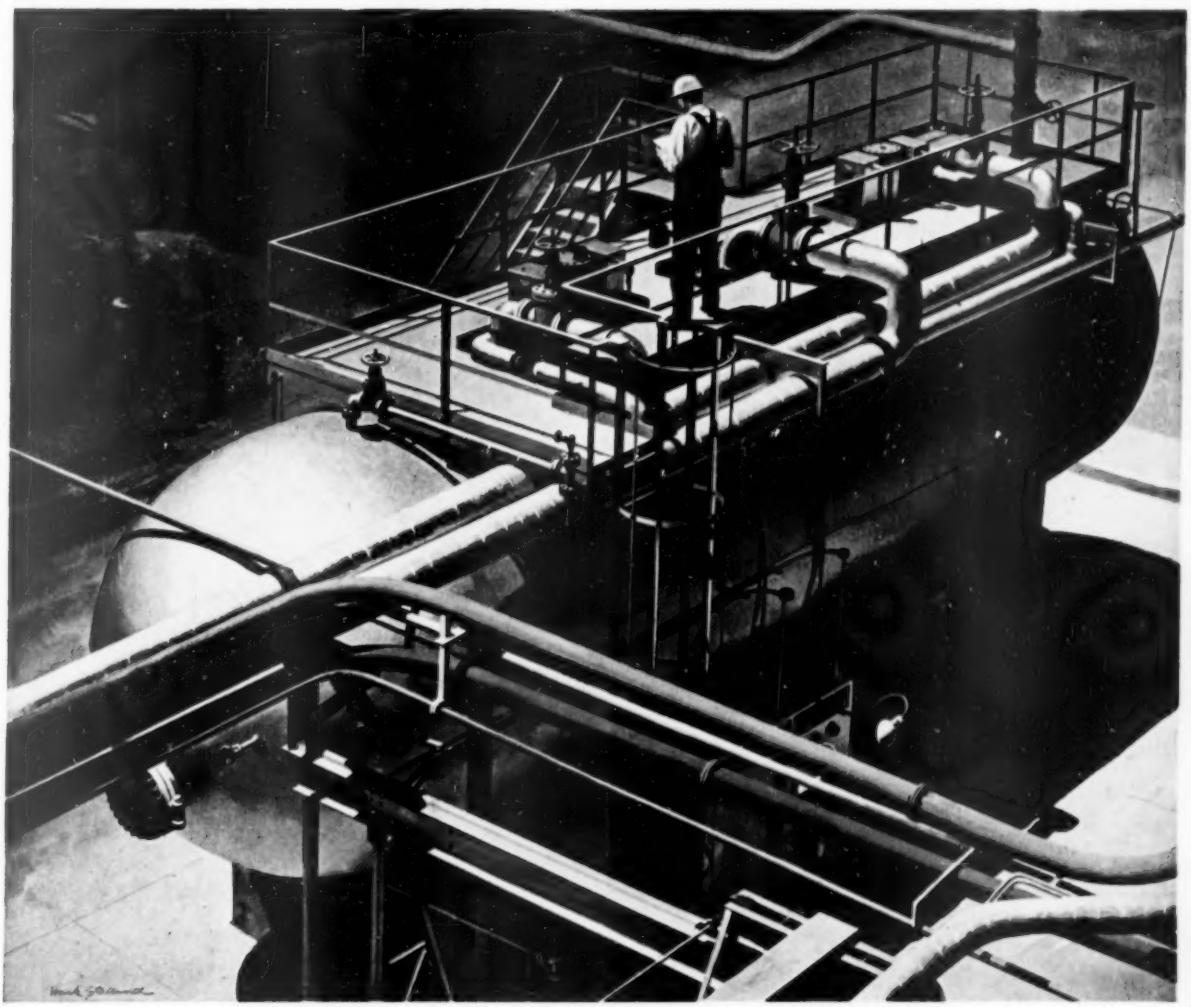
THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

We have "salesmen" on 3 continents...our customers

In Europe, South America and throughout North America . . . wherever refiners require unqualified results in the treatment of petroleum emulsions . . . Howe-Baker custom built installations will be found meeting the most exacting demands. Because of this consistent performance Howe-Baker customers become our best salesmen. Refer your desalting problems to us.

SPECIALISTS IN PETROLEUM EMULSIONS

HOWE-BAKER CORPORATION
ESPERSON BUILDING HOUSTON, TEXAS



MILL SCALE REMOVED CHEMICALLY FROM NEW PLANT EQUIPMENT

Entire ammonia plant cleaned after erection. Job done in 4 days, cutting operator's estimated cleaning cost almost 50%.

A new synthetic ammonia plant had just been erected. The operator wanted to remove the mill scale from the entire operating system before the plant was put into production. This would eliminate dangers of product contamination, retarded heat transfer and further corrosion. And once the plant was put into operation, it could stay on stream.

Dowell engineers did the job in just 4 days. They used chemical solvents to remove the mill scale from all equipment in the ammonia, oxygen and lube systems—compressors, after-coolers, intake, discharge, hydraulic and synthesis lines, nitrogen knockouts, synthesis and raschig ring towers, and ammonia bowls. Solvents were applied through regular connections—no dismantling was required.

The operator indicated that Dowell Service saved his company almost 50% over their own estimated cost of removing the scale using mechanical methods.

Dowell engineers apply their wide chemical experience to your problems.

Dowell engineers do the job for you. They bring chemical solvents in truck-mounted tanks right to the job. They furnish all necessary pumping and control equipment. Solvents are applied according to the techniques demanded by the job: filling, spraying, jetting, cascading or vaporizing. These liquid solvents go wherever steam and water flow, reaching surfaces inaccessible to other cleaning methods. No special scaffolding is required. *There is usually no dismantling, and downtime is held to a minimum.*

Perhaps chemical cleaning can help increase the efficiency of equipment in your plant. For complete information and cost estimates, call your nearest of over 130 Dowell offices—no obligation, of course. If you prefer, write directly to DOWELL INCORPORATED, TULSA 1, OKLAHOMA, Department D-11.

DOWELL SERVICE

chemical cleaning service for industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

REFINING

Toluene Study

Avgas, explosives taking bulk of product at present

NEW YORK.—The bulk of toluene produced from petrochemical and other base stocks in this country is going to aviation gasoline and explosives. This is revealed in a report recently completed by the Chemical and Rubber Division, Business and Defense Services Administration, U. S. Department of Commerce.

The report, No. 3 in a current series of individual chemical analyses made by the BDSA as a service to business, shows the overriding effect of the Korean emergency in the end-use pattern for toluene.

	1950	1951	1952
U. S. production	76,830	96,585	98,525
Imports		8	136
Total supply	76,830	96,593	98,661
Capacity, Jan. 1	114,063	115,143	120,996
Est. consumption:			
Explosives	722	6,700	24,496
Aviation gaso.	27,996	35,827	40,169
Pet. refining	547	623	635
Chem. synthesis	13,975	18,629	17,161
Paints, varnishes and resins	20,369	20,060	6,459
Other protective coatings	5,520	5,435	1,750
Solvents	2,357	2,322	748
Other	4,546	5,096	4,051
Total consumption	76,032	94,692	95,469

Capacity for producing toluene, including the toluene content of solution grades, rose 45 million gallons, or 39 per cent, from the first of 1950 to the first of 1953. Its end use for explosives manufacture showed the most spectacular rise, from 722,000 gal. in 1950 to 24,496,000 gal. in 1952—a reflection of the military needs for munitions in Korea. Aviation gasoline continued to take a greater proportion of total production over the 1950-1952 period, accounting for 42 per cent of all output in 1952.

Summary of the report, with data in thousands of gallons per year, converted to a 100 per cent toluene basis, is shown in the accompanying table.

Four Firms Contribute to Growing New-Product List

The latest list of new products offered the driving public includes another new super gasoline, two lube oils, and a multipurpose automotive grease.

Sinclair Refining Co. last week joined several other major companies in unveiling a new "six benefit" gasoline. The company claims the new product offers preignition control, top mileage, antirust protection of fuel systems, 70 per cent less piston ring wear, and 41 per cent less combustion chamber deposits. The fuel will be known as "New Stepped Up Power-X Gasoline."

A new lithium-base grease has been introduced by the Gulf Oil Corp. The

New Humble Deasphalting Unit on Stream

Humble Oil & Refining Co. recently put on stream this new deasphalting unit at the Baytown, Tex., refinery. It processes low-grade crude oil, recovering about 16,000 bbl. per day of clean gas oil for catalytic cracking. It also turns out about 12,000 bbl. of asphalt daily when in full-scale operation.

Use This EASY Way to COMPARE VALVES!

Know your valve equivalents! Be able to compare different makes of valves—quickly—accurately!

Whether you check on valve specifications of others, or actually specify, you'll be money ahead to use the "Equivalent Valves" manual. The NEW, revised edition, now ready, compares valves of 20 manufacturers by material, type, pressure rating, structural variations, sizes. 50,000 postings in its 175 looseleaf pages. Red and Black leatherette cover with heavy spring closing rings. Measures 9" x 12" x 3". Weighs 5 lbs. Hundreds in use by major companies everywhere. Price $19.75 ($21.75 export). Annual revision service is also available. We gladly send on **approval**. Order your copy TODAY!

EQUIVALENT VALVES COMPANY
8617 Cimarron Street Los Angeles 47, California

Write or Wire for Monthly Stock Lists

- **VALVES**
- **PRESSURE TUBING**
- **STEEL**

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

OIL ROTS RUBBER IS *YOUR* FIRE HOSE SAFE?

GET **Bi-Kleen**

THE HOSE CLEANER THAT FIRE DEPARTMENTS USE!

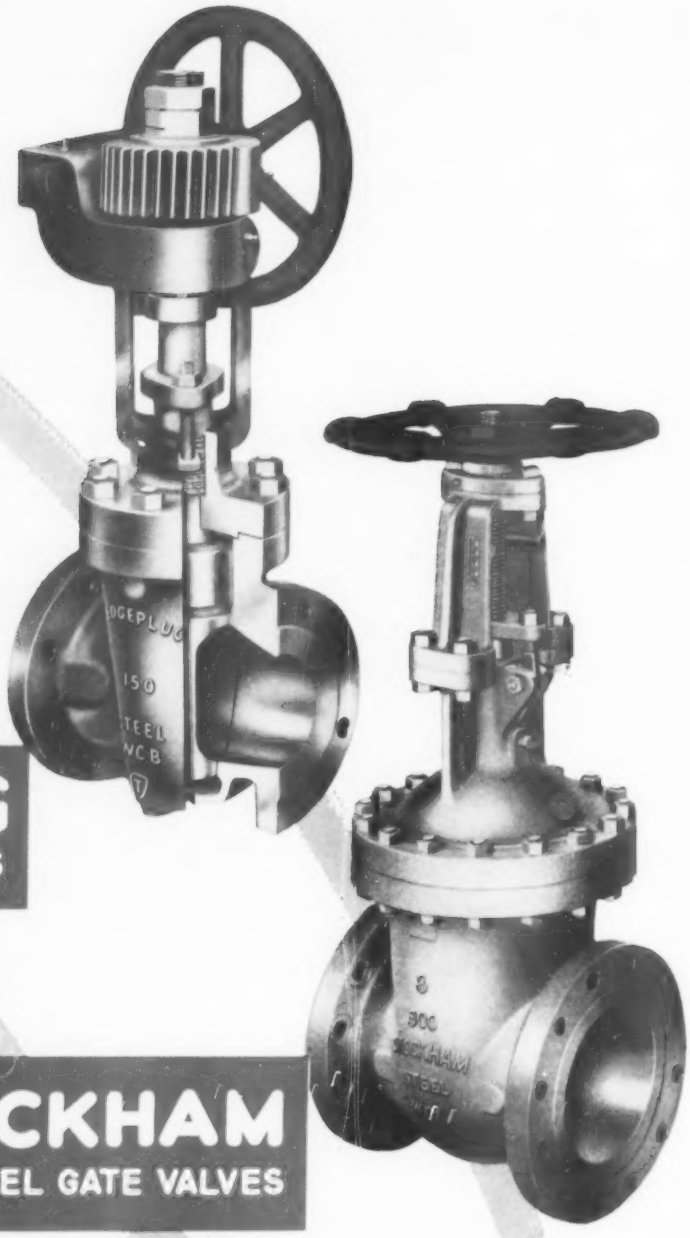
When cotton rubber-lined fire hose contacts oil or dirt, it's washed *immediately* in safe, non-toxic *Bi-Kleen*, made exclusively for washing cotton hose — Send for a 10 lb. trial order today. Sold by the makers of the finest fire hose in the world — *Bi-Lateral* flat folding, non-creasing fire hose!

BI-LATERAL FIRE HOSE COMPANY
20 North Wacker Drive, Chicago 6, Ill.

for

Dependable Service

SPECIFY



WEDGEPLUG
STEEL DRY PLUG VALVES

and

STOCKHAM
CAST STEEL GATE VALVES

WEDGEPLUG VALVE COMPANY, INC.
NEW ORLEANS 15, LA.
An affiliate of
STOCKHAM VALVES & FITTINGS
GENERAL OFFICES AND PLANT, BIRMINGHAM 2, ALABAMA
Warehouses and Offices
PHILADELPHIA • CHICAGO • BOSTON • ATLANTA
LOS ANGELES • NEW YORK • HOUSTON • DALLAS
PITTSBURGH • ST. LOUIS • WASHINGTON • SAN FRANCISCO

STEEL DRY PLUG VALVES • CAST STEEL GATE VALVES • BRONZE VALVES
IRON BODY VALVES • PIPE FITTINGS

DISTRIBUTED THROUGH WHOLESALERS

Write for
STOCKHAM and
WEDGEPLUG
catalogs

BETTER, FASTER, SAFER,
plug valve lubrication
WITH DELTA FITTINGS

The grease fitting on a plug valve is a small, unnoticed item, until it becomes defective—then it becomes a mighty mite. A bad fitting can injure a man, ruin a valve, or be responsible for serious loss in case of emergency. That's why you should standardize on DELTA FITTINGS—with double-check valves, one-piece steel bodies, and guaranteed not to leak at 15,000 lbs. pressure. No gaskets to wear or loosen causing leaks and locked couplers. And—DELTA is the only company that offers grease gun fittings for ANY lubricated plug valve.

The DELTA High Pressure GUN

Develops 10,000 lbs. pressure. Barrel tested to 30,000 lbs. Fast, positive prime, handles heaviest lubricants.

Get this CATALOG

Valuable, specific information on Delta Fittings, Gun, Automatic Lubricator, and Delta-Desco Lubricants for any valve service.

DELTA ENGINEERING SALES CO.
806 Louisiana Ave. Shreveport, La.
Sales Offices In All Principal Cities

DELTA
Plug Valve
LUBRICATION EQUIPMENT
Fittings . . . Guns . . . Lubricants
Automatic Lubricators

company says the new grease provides superior lubrication for all automotive grease requirements and eliminates the need for specialized greases for the chassis bearings, wheel bearings, water pumps, universal joints, and covered springs.

Standard Oil Co. (Ind.) and Sun Oil Co. have developed the new motor oils. Standard claims its Super Permalube will save 2 gal. of gasoline in a tankful and cut oil consumption by an average of 37 per cent. Sun says its new product, Sunoco Special Hi-Compression Motor Oil, will reduce the octane requirements of high compression engines up to five octane numbers.

Dow Buys Columbia Stock

MIDLAND, Mich.—Dow Chemical Co. has acquired 85 per cent of the stock of Columbia Oil Shale & Refining Co. in a $1,500,000 transaction.

Petrochemicals

Plant to Reopen

Missouri Ordnance Works leased by Hercules Powder

LOUISIANA, Mo. — The Government-owned Missouri Ordnance Works will be reopened here by Hercules Powder Co. of Wilmington, Del.

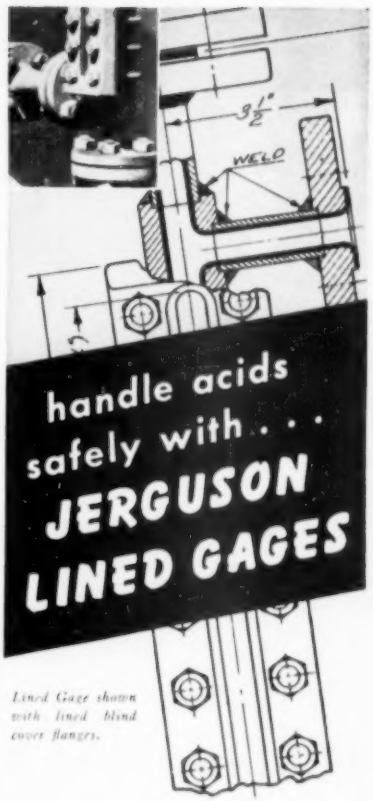
Hercules has leased the plant from the U. S. Corps of Engineers with an option to buy. The company will rehabilitate the plant and expects to start producing ammonia within 3 months.

The plant has three high-pressure anhydrous ammonia lines with an annual capacity of 42,000 tons of ammonia. Natural gas is used as a raw material. The three lines are expected to reach capacity operations within 5 months.

Hercules, builder and first operator of the plant, had an option of taking over the plant from the Corps of Engineers at the highest bid received by the Government. Hercules exercised the option with a bid of $3,625,000.

Hercules built the plant in 1941-42 for the Ordnance Department. Two of the five original lines have since been dismantled and set up at San Jacinto, Tex., for ammonia production.

The company operated the plant until the fall of 1945, when it was shut down and placed on a stand-by condition. The Bureau of Mines operated a demonstration plant in the works for more than 5 years, until April 13, 1953 *(The Oil and Gas Journal, April 20, 1953, page 111).*



Lined Gage shown with lined blind cover flanges.

WHERE concentration of liquids such as sulphuric, muriatic or other acids necessitates equipment with special linings, Jerguson can furnish you with reflex or transparent gages lined with natural and synthetic rubbers, lead, phenolic base compounds, Teflon, and other materials. Jerguson Lined Gages are designed to meet your requirements of long-life and dependable operation.

To meet your constantly increasing variety of demands, Jerguson engineers, working closely with the men in the Chemical and Petrochemical Fields, have developed a complete line of sound, dependable liquid level gages, valves, and specialties in various metals and synthetics to handle corrosive liquids and gases.

Jerguson Gages keep you out of trouble, and they save you time and money. Send for drawing GD-431 on Lined Gages, or send your requirements.

JERGUSON
Gages and Valves for the Observation of Liquids and Levels
JERGUSON GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.
Offices in Major Cities
Jerguson Tress Gage & Valve Co., Ltd., London, Eng.
Pétrole Service, Paris, France

R. S. DEAD WEIGHT GAUGE

the practical and accurate method of checking

- Line pressures.
- Rock pressures at wells.
- Static pressure on orifice meters.
- Gas pressures on pipeline leakage tests.

This instrument is based on the principle of generation of pressure by application of a known weight to a hydraulic piston of known area. Conversely, an unknown pressure can be measured by balancing its force on a piston of known area with a known weight—the result is extremely accurate pressure readings.

cenco

Cenco . . . one dependable source of supply for everything you need in scientific instruments and laboratory supplies. Over 15,000 items . . . 14 branch offices and warehouses.

R.S.C. TULSA

REFINERY SUPPLY COMPANY

621 EAST FOURTH STREET ● TULSA 3, OKLAHOMA

2215 McKINNEY AVENUE ● HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY

1700 IRVING PARK ROAD ● CHICAGO 13, ILLINOIS

CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO

SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

MULTIPLE OFFICES mean BETTER SERVICE

EXPERIENCE means BETTER PIPE LINES

NORTH AMERICA

EDMONTON
TORONTO
TULSA
MINNEAPOLIS
NEW YORK
LOUISVILLE
WASHINGTON
ATLANTA
HOUSTON
NEW ORLEANS

SOUTH AMERICA

CARACAS
MARACAIBO
BOGOTA
LA PAZ
RIO DE JANEIRO

MAIN OFFICE: TULSA

Pipelines are NOT sidelines with

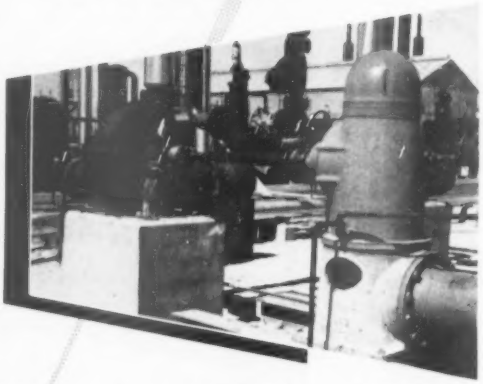
WILLIAMS BROTHERS

ENGINEERS
CONTRACTORS

OIL • GAS • PRODUCTS • WATER
PIPELINES AND PUMPING STATIONS

Write your nearest Williams Brothers office

Request AMARILLO DRIVE



When choosing a pump for your refining operations, be sure to request Amarillo Right Angle Pump Drive—the drive that's adaptable to any make of deep well turbine pump. For full information, contact your local pump dealer.

Amarillo Drive adapted to cooling tower operation.

Amarillo Right Angle Pump Drive Co.

213 NORTH POLK ST. AMARILLO, TEXAS

Manufactured by Amarillo Welding & Machine Works

PIPELINE

Crude-Line Setback

Government refuses to back West Coast plans

WASHINGTON.—Prospects of building a 1,030-mile crude-oil line from West Texas to the West Coast were dimmed considerably last week when the Government refused to guarantee a loan for the long-sought project.

Assistant Defense Secretary C. S. Thomas disclosed in a letter to Deputy Petroleum Administrator Joseph A. LaFortune that the defense department will not recommend that a certificate of essentiality be issued West Coast Pipe Line Co., which is proposing the crude line. The certificate would provide a government guarantee for a private loan for the project.

In declining to give Defense Department backing to the Texas-to-California line, Thomas announced the department favors construction of an East Coast line over a West Coast line based on the "strategic and logistic significance in time of war."

Company quiet . . . West Coast officials in Dallas declined to comment on the government action, but indicated the company has additional plans for building the line.

The Defense Department setback is only one of several West Coast has received since it began in 1944 pushing the proposed line. Their plans call for a 24 and 26-in. carrier from Midland, Tex., to Norwalk, Calif.

The company's sole reason for seeking government approval of the project was to obtain financing. The company previously pointed out the system would have to carry a minimum of 75,000 bbl. daily to break even. They were asking that the Treasury Department make up any deficit if the deliveries fell below 75,000 bbl. *(The Oil and Gas Journal, March 15, page 78).*

The line would cost an estimated $106,000,000 with $21,500,000 coming from equity capital. Bond sales to insurance companies were expected to raise the remaining $85,000,000.

Stresses East Coast line . . . Thomas' letter reiterated the department's policy of not endorsing a specific pipeline project.

Thomas used the department's views on the West Coast line as a basis for insisting that priority be given an East Coast line.

"It has been concluded that a crude-oil pipeline from West Texas to California would contribute to the national security and would have strategic and logistic significance in time of war," Thomas said. "However, it has been further concluded that the need for pipeline transportation of crude oil to the East Coast in time of war far outweighs the need for such transportation to the West Coast."

He added that "first priority" should be given construction of the East Coast line over the West Coast project.

Contract Will Be Let Soon For Andrews-Midland Loop

DALLAS.—Atlantic Pipe Line Co. expects to let contract within 30 days for a 40-mile, 8-in. loop of its present 8-in. crude line from Andrews, Tex., to Midland.

First pipe for the project arrived on site last week. R. P. Paden, assistant general manager, said in Dallas last week that all pipe is en route.

The line will have an initial capacity of about 14,000 bbl. daily. This can be boosted to 28,000 bbl. daily, Paden said, by installing a pumping unit at Andrews. The line is expected to be in operation by mid-June and will handle increased production in the Andrews area.

Atlantic also will lay 13 miles of 6-in. in Gaines County to the north to take care of production in Russell multipay field. The line will run from the field to Atlantic's Seminole, Tex., pump station. There it will be pumped through Andrews to the company's tank farm at Midland.

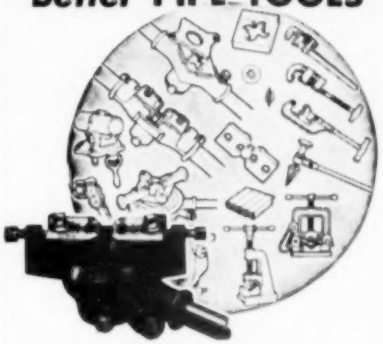
In Hockley County, Atlantic Pipe Line has turned over operation of a 43-mile line connecting Slaughter field to Shell Pipe Line Corp. The line was formerly owned by Sid Richardson, Inc., Fort Worth, and has been operated by Atlantic under lease.

Gas Compressors Institute

LIBERAL, Kans.—A 2-day gas compressors institute will be held here May 3-4 in the Legion Hall. The institute is sponsored by the Southwest Kansas Petroleum Industry, the University of Kansas Extension Department, and the University of Kansas Department of Petroleum Engineering.

The meeting will include lectures

ARMSTRONG BROS.
Better PIPE TOOLS



Reversible Ratchet STOCKS and Adjustable DIES

Exceptionally convenient where space is limited, this stock simplifies pipe threading close to walls, in corners and wherever operating room is restricted. With *adjustable* dies (cut exact, over or under size threads) it is an ideal tool where valves and fittings are being installed or maintained.

"ARMSTRONG BROS." Adjustable dies are of special Vanadium Tool Steel, have "backed-off teeth, correct cutting angle, ample chip clearance and correct throat angle. They start and cut easily, hold their sharpness and "spin" off pipe without jamming or tearing threads.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5204 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

. . . Skill

In every phase of pipe line construction is an important factor in Houston Contracting's facilities.

HOUSTON CONTRACTING CO. LTD.
General Contractors
OIL • GAS • GASOLINE • WATER PIPE LINES
2707 FERNDALE • HOUSTON 6, TEXAS
GENERAL PARTNERS
LAURENCE H. FAVROT • R. P. GREGORY
ASSOCIATE
GEORGE A. PETERKIN

McFARLAND
DOUBLE POWERED
HYDROSTATIC
TESTING PUMP
Rental!

Two-Stage, double-acting, reciprocating pumps operated by air, water, gas or other fluids under pressure. Discharge to input pressures range from 200/1 down 20/1. Large discharge capacity and instant build-up of pressures saves hours of testing time. Ideal for operating blowout preventers, for testing valves, pipe, fittings, pipe lines, tanks, boilers and other pressure vessels.

Write for rental rates on testing pump you need.

McFARLAND
MANUFACTURING CORP.
1630 Roberts St. Phone: FAirfax 7165
Houston 3, Texas

and panel discussions on reciprocating, rotary, centrifugal, and stage compressors.

Platte Expansion Includes Building Four New Stations

KANSAS CITY.—Platte Pipe Line Co. announced plans last week for an expansion program that will increase its capacity to 195,000 bbl. daily through construction of four new and enlargements of five existing compressor stations.

The new stations will be located at Moorefield and Deshler, Neb.; Hiawatha, Kans.; and Bosworth, Mo. Existing stations that will be enlarged include those at Gurley, Ogallala, and Holdrege, Neb.; Marysville, Kans.; and Gower, Mo.

Construction already has begun on the Holdrege and Gower stations. This work will be completed in early June, boosting the capacity to 145,000 bbl. daily. The entire expansion, which will cost an estimated $2,700,000, will be completed in late summer.

All stations except Gurley will be remotely operated and supervised by microwave from Platte's headquarters in the Power and Light Building, Kansas City.

See Composite and Refinery Catalogs, or Write for Folder On

FLEET-LINE
PIPE SADDLES
AND REDUCERS

Nozzle sizes from 1/4" to 24"
ASTM A234
Also for pressure vessel heads
Nominal pipe sizes 1" to 30"
Special sizes, lengths, schedules
ASA B16.9
ASTM A234
Eccentric

Immediate Delivery
STEEL FORGINGS, Inc.
P. O. Box 2768 • Shreveport, La.
Foot of Fannin Street

Get
Our Bid
Before You
Paint

PENNER & CHENEY
Specialists in Oil Industry Painting
For More than 13 Years
1502 E. Lancaster Phone FA-6274
FORT WORTH, TEXAS

Trans Mountain Awards Contract for Ferndale Spur

VANCOUVER, B. C. — Engineers Limited Pipeline Co., of San Francisco and Seattle, has been awarded the contract to build 15 miles of 20-in. and 11 miles of 16-in. line for the Trans Mountain Oil Pipe Line Co.

The crude line runs generally southwest from a point on the British Columbia-Washington border near Sumas to the refinery of General Petroleum, Ltd., now under construction, near Ferndale, Wash. The line is called the Ferndale Spur.

Construction on the line is expected to start May 1.

NEW! Write for Bulletin.
Patented
PIPELINE
VENTS AND
MARKERS

FLEET-LINE CO.
P. O. BOX 2768
SHREVEPORT, LOUISIANA

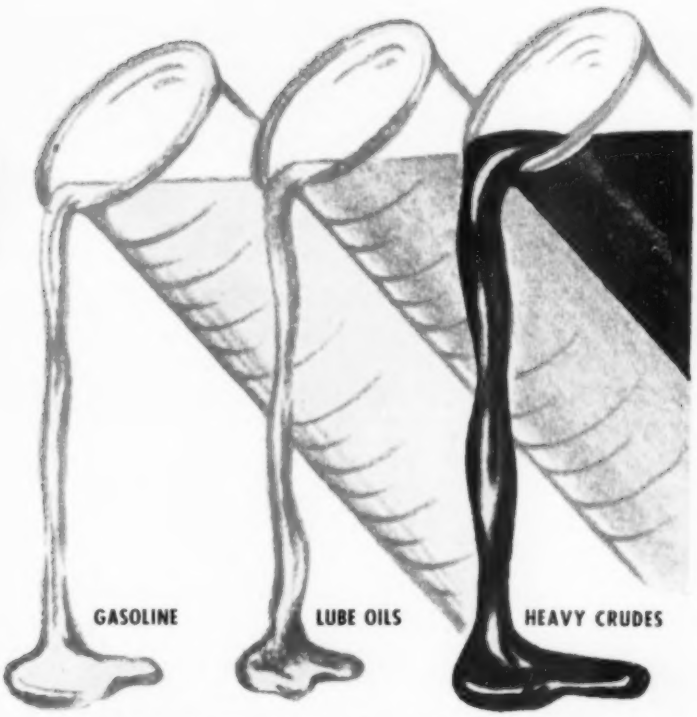
Alaskan Pipeline Inspection Started by Houston Company

HOUSTON.—Isotope Products, Inc., of Houston has begun radiographic and visual inspection of the 620-mile, 8-in. products pipeline being constructed by the U. S. Army from Haines to Fairbanks, Alaska.

The Houston company has subcontracted a portion of the work to two Canadian affiliates, Isotope Products, Ltd., Edmonton, Alta., and Petrol-

THE
PARCO COMPANY
INCORPORATED
PARCO
DESIGN PERTAINING TO ALL PHASES OF
Power, Petroleum and
Chemical Plants
82 Beaver Street, New York 5, N. Y.

FULL VISCOSITY RANGE



with Brodie *BiRotor* Meters

- **Basic BiRotor principle employed in all sizes and capacities of BiRotor Meters.**
- **BiRotor Meters handle full range of viscosities from gasoline and lube oils to heavy crudes.**
- **Double case construction avoids distortion or damage to measuring unit.**
- **Interchangeable unit built assemblies readily inspected or replaced without disturbing line connections.**

from heavy crudes to finished products

Brodie BiRotor Meters in a full range of sizes and capacities fill every metering need for fast, accurate handling of all viscosities from lighter stocks to heavy crudes. Whatever your petroleum metering operation may be — pipe line, stock transfer, or storage — batching, blending, barreling or packaging—there's a BiRotor Meter to meet your exacting requirements. For high maintained accuracy, low maintenance and long-lasting dependable service, investigate Brodie BiRotor Meters today.

ALL-STEEL BiRotor TRUE-ROTARY

BRODIE METERS

RALPH N. BRODIE CO., INC. • ALVARADO & WEST 137th AVE., SAN LEANDRO, CALIFORNIA, U.S.A.

MT. VERNON, N. Y.	CHICAGO 5, ILL.	DALLAS, TEXAS	SEATTLE 9, WASH.	LOS ANGELES 22, CALIF.
550 So. Columbus Ave.	59 E. Van Buren	167 Parkhouse St.	221 9th Ave. N.	5401 E. Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

install
peak performance
into your
compressors (AIR · GAS · AMMONIA)

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.

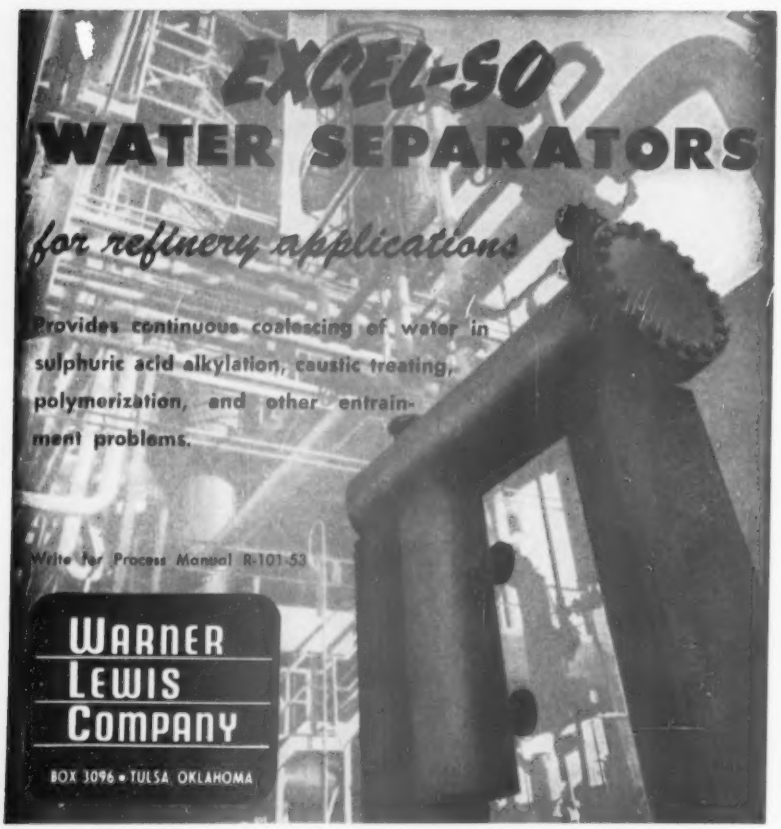
Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

Check THESE VOSS VALVE ADVANTAGES:

✔ Quiet, vibration-free operation ✔ 20 to 60% more valve area ✔ less power consumption ✔ minimum pressure loss ✔ normal discharge temperature ✔ lower operating costs ✔ utmost safety

Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

VOSS VALVES / J. H. H. VOSS Co., Inc. 786 East 144th Street, New York 54, N. Y.


EXCEL-SO
WATER SEPARATORS
for refinery applications
Provides continuous coalescing of water in sulphuric acid alkylation, caustic treating, polymerization, and other entrainment problems.
Write for Process Manual R-101-53
WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

Structors, Ltd., Calgary, Alta. About 40 per cent of the work is in Canadian territory.

Kansas-Nebraska Seeking Authorization to Expand

WASHINGTON.—Kansas-Nebraska Natural Gas Co., Inc., Phillipsburg, Kans., has applied for Federal Power Commission permission to construct 223 miles of pipeline and 2,700 hp. in compressor capacity to provide additional facilities for its system in central and northeastern Nebraska.

The proposed construction will cost an estimated $4,096,890. The new pipeline mileage would range in size from 6 to 12 inches. The added compressor capacity would be split with 1,500 hp. going to a new station and the remaining 1,200 hp. to an existing station.

Construction of Natural-Gas Compressor Plant Launched

DENVER.—Construction has begun on a natural-gas compressor plant near Sterling, Colo., that will serve the Mount Hope and Walker fields.

Jointly building the plant are Paul E. Barnhart, J. Ray McDermott & Co., Inc., Kansas-Nebraska Natural Gas Co., Inc., The Texas Co., Bay Petroleum Corp., and Shell Oil Co. Blaw-Knox is contractor on the job.

The plant will have a capacity of 4,500 M.c.f. of gas daily from field pressure of 5 psi. to 800 psi. It is scheduled for completion in early fall.

Iowa Hearings Delayed

WASHINGTON.—A Federal Power Commission hearing on two related applications involving proposed construction of pipeline facilities and transportation of natural gas for distribution in Villisca and Clarinda, Iowa, has been postponed from April 14 to May 19. The applications are by Lateral Gas Pipeline Co. and Iowa Electric Light & Power Co., both of Cedar Rapids, Iowa.

Public Hearings Scheduled

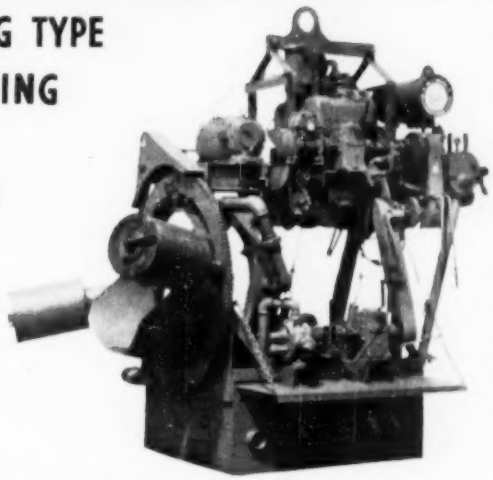
WASHINGTON. — Public hearings will begin here May 3 before the Federal Power Commission on an application by Arkansas Louisiana Gas Co., of Shreveport, La., to build approximately 108 miles of pipeline and a new 10,500 hp. compressor station on its natural-gas transmission system in Arkansas, Louisiana, and Texas. The construction will cost an estimated $9,245,166.

CROSE SPRAY-RING TYPE COATING & WRAPPING MACHINE

Most Popular Coating and Wrapping Machine . . . .

Because:

- It coats around bends and over irregular pipe.
- Positive spray-ring coating leaves a continuous film (no patching necessary).
- Extra heating jacket keeps dope from freezing in spray ring.
- Built-in strainer prevents foreign particles from getting to pipe surface.
- Saves as much as 30% on dope.
- Available with rubber or steel crawler wheels that assure positive traction. Available for all sizes of pipe.



m.j. Crose Manufacturing Company, Inc.

2715 DAWSON ROAD • TULSA, OKLAHOMA • U. S. A.

BRANCH OFFICES: HOUSTON • NEW YORK • NEWARK, N. J. • EDMONTON • DENVER

SPECIALIZED EQUIPMENT FOR THE PIPELINE INDUSTRY

"King-Size"* 1953 Pipe Line Wall Charts

1. Crude Oil and Products Pipe Line Map
2. Natural Gas Transmission Pipe Line Map

$2.00 —Both Maps— $2.00

*The largest maps ever published by The Journal—42" x 56"—printed in color on both sides of one sheet. Here are two maps with up-to-date details on all existing and proposed pipe lines in the United States and Canada.

Reader Service Department

THE OIL AND GAS JOURNAL

Box 1260 Tulsa 1, Oklahoma

TEXAS OIL

Attractive Multicolor Wall Map

An up-to-the-minute survey of oil and gas activity in the State of Texas. Drawn and published especially for readers of The Oil and Gas Journal.

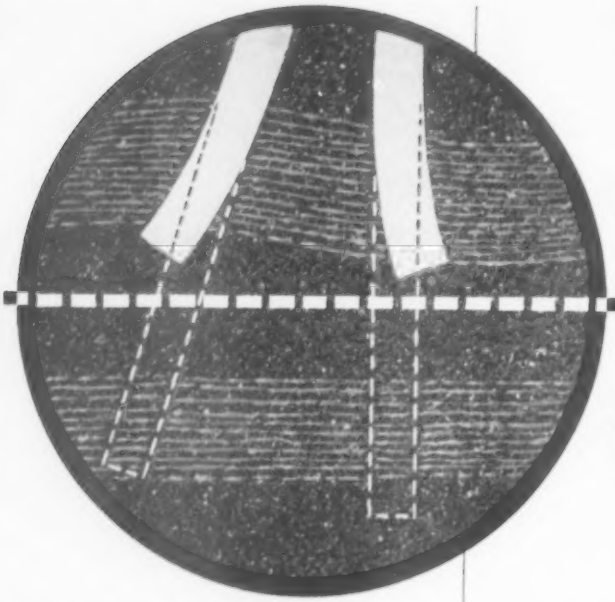
Shows all crude-oil and products pipe lines
Shows all natural-gas pipe lines
Lists oil pools and gas pools
Shows salt domes with producing oil or gas.

Two inset illustrations of Texas show Natural-Gas Pipe Lines as well as Crude-Oil Products Pipe Lines. Size of map 33 x 45 inches. Copyright 1951.

$1.50 each.

Mail orders to Reader Service Dept.

THE OIL AND GAS JOURNAL
Box 1260 Tulsa, Okla.



If this is what you're getting...

and this is what you want

Straightening the hole is easy as...

It's as simple as that! This method has been proved from California to Louisiana, by many operators in different fields.

Here's how it works. The special angle of the gauge cutter teeth makes flatter contact with hole bottom, quickly cutting a new profile on the *low* side of the hole... the *extra* clearance provided by the body design keeps the bit from being pushed toward the old axis of the off-course hole. Result: you break the angle easily and gradually, bringing the hole back on course *without* making a bad dog leg.

The new H. C. Smith "SHOULDER" Bit is available in sizes 8 3/8" to 12 1/4"; sizes 8 3/8" to 9 7/8" supplied only with 4 1/2" A.P.I. pin. Remember—*light weight on the bit* is necessary for satisfactory service!

A Use the new H.C.Smith "SHOULDER" bit

B with light weight on the bit...

C ..and high rotary speed!

-every bit as good as the best

this new "SHOULDER" bit is an exclusive development of...

H C Smith OIL TOOL CO. Branches in All Principal Oil Centers in the United States and Canada

GENERAL OFFICES, EXPORT OFFICES AND PLANT • COMPTON, CALIF.

Among the

Drilling Contractors

Denver Firm Sets Record

A RECORD of drilling 35 wells averaging 3,013 ft. each, with one rig, in a 361-day period has been established by drilling crews of Carmack Drilling Co., of Denver.

Operating in the Sussex area of Wyoming's Powder River basin, the rig drilled 13¾-in. surface holes for the first 180 ft., and 9-in. holes for the remainder of each well, for a total of 105,444 ft. of hole.

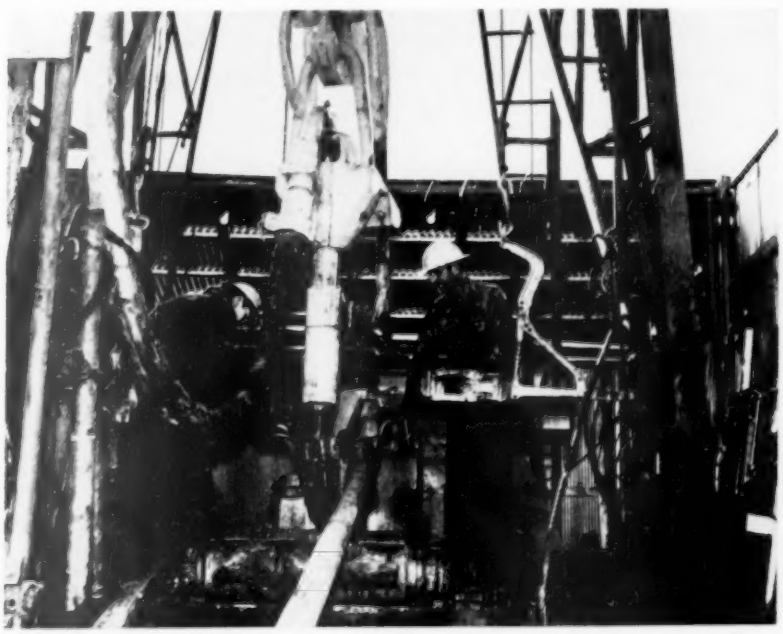
Only 4½ days were lost because of rig service and equipment repairs. W. L. Stokes served as tool pusher. The rig used is an Ideal Type T-20. The rig is rated at 200 input horsepower. The draw works, power equipment, and an 87-ft. Lee C. Moore mast is mounted on a 10-ft. substructure. With the mast laid down, the entire unit can be moved over the rough terrain of the Sussex area.

An independent pump drive, consisting of a 7¼ by 14-in. pump and powered by a torque-converter-equipped engine is skid-mounted and can be moved as a separate unit. Moves between holes ranged from ½ to 5 miles, totaling 85 miles, with an average moving time of 15 hours.

Carmack Drilling Co. was established in 1950 and incorporated in 1951. Harold Carmack is president and Cal York vice president. The firm first pur-

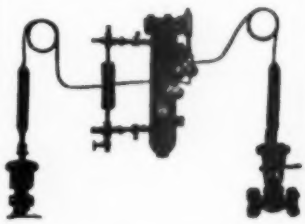
SUMMARY OF OPERATIONS
(35 Wells)

	Days	Per cent of total
Moving	22.12	6.13
Rigging up	13.95	3.87
Tear down	11.06	3.06
Drilling on bottom	61.18	16.95
Coring on bottom	2.31	.64
Reaming	.12	.03
Tripping	29.61	8.20
Running casing	8.66	2.40
W.O.C.	96.31	26.68
W.O.C. squeeze	.08	.02
Mix mud	19.09	5.29
Testing	8.46	2.34
Completing	43.07	11.93
Swabbing	6.96	1.93
Fishing	2.69	.75
Stuck pipe	.57	.16
Lost circulation	.37	.10
Weather and roads	1.94	.54
Rig-repair service	4.64	1.28
Other delay	27.81	7.70
Total 35 wells	361.00	100.00



Scene on the derrick floor of Carmack Drilling Co. rig. Operating in the Sussex area of Wyoming's Powder River basin, over a 361-day period, this rig has averaged a 3,013-ft. well in a trifle over every 10 days.

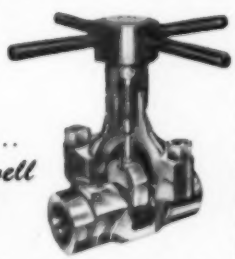
Like An Extra Employee!



Yes, having an INFERNO Boiler Safety Unit is like having an extra employee on the job because it frees the fireman for other duties and provides a three-way safety precaution against accidents. Can't be beat for protection against explosions. Write for Bulletin 15-B for full details.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

An ALL-NEW mudline valve



Because . . .
Rockwell Built

MUDWONDER'S

one piece body remains in the line while maintenance work is being done, MUDWONDER keeps . . .

PIPING HOOK-UPS FIXED Get complete information from your supply store today.

Edward Valves, Inc.
Subsidiary of ROCKWELL MFG. CO.
1492 W. 145th STREET
EAST CHICAGO (phone 231)
INDIANA

Low-Cost

UTILITY BUILDINGS

Easy to Erect, Dismantle, Move

Need **portable** field offices, supply sheds or bunkhouses in your business? Here's the answer —HOUSTON UTILITY BUILDINGS. They're sturdy and durable, **ready-cut** and predrilled for quick erection by any crew. They're available for immediate delivery.

- **8- 12- and 16-foot SPANS**
- **8- to 28-foot LENGTHS**

Write or phone for specifications and quotations.

HOUSTON *Ready-Cut* HOUSE CO.

Prefabricators Since 1917

P. O. BOX 224 HOUSTON, TEXAS PHONE FA 6365

RUGGED— ACCURATE— EFFICIENT!

#3480

100 C.C.

CENTRIFUGE

You can maintain your required speed for the full period of the test with much less effort. Curtin centrifuges, proven world-wide, are heavy duty, rigidly constructed, and extremely simple in design. Illustrated bulletin, giving full details, available upon request.

W·H·CURTIN & CO.

HOUSTON . . . NEW ORLEANS

chased an Ideal Type 50-A rig, and later the Ideal Type T-20 rig.

Tri-Province Drilling Co., Ltd., has contract for Southern Production Co., Inc.'s new exploratory test 18 miles southwest of Fort St. John in northeastern British Columbia. The new driller is Southern Production B-2-1 Atlantic, LSD 16, 35-80-20w6. The wildcat is scheduled for completion in the Permo-Penn formation. It is 10 miles southwest of Pacific 1 Pingel Creek, an unsuccessful exploratory venture and 20 miles northwest of gas production in the Sunrise field.

Commonwealth Drilling Co., Ltd., has contract for Tide Water Associated Oil Co. 1 Valley Centre Crown, LSD 16, 10-33-14w3, 8 miles northwest of Valley Centre rail point, 28 miles northwest of Milden in West Central Saskatchewan.

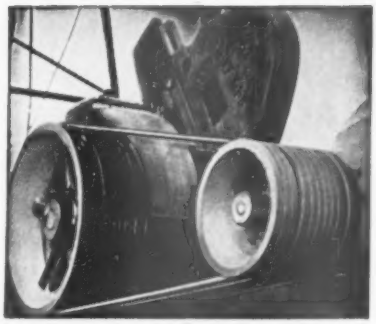
Jett Drilling Co., Inc., Shreveport, will handle contract for 1 J. M. Jones, 30-4n-9e, 1 mile north of Roseland field Wilcox production in Concordia Parish, Louisiana. The wildcat is the first of a two-well wildcat program in the Brabston area by Calto Oil Co. and G. W. Gulmon.

Goldrus Drilling Co. is moving in to drill Goldston Oil Corp. 1 Willis, projected 9,500-ft. wildcat 6½ miles southwest of Taft in San Patricio County, Texas. The 1 Willis is in W. B. Blanchard Survey 8, Abstract 77. The wildcat is about 2½ miles northwest of production in East White Point field of San Patricio and Nueces counties.

Loffland Bros. Drilling Co., Tulsa, is contractor for two Bourg field tests in Terrebonne Parish, South Louisiana, for Cities Service Oil Co. The 11,800-ft. Miocene tests are the 2 LeBlanc 6-B, 42-17s-18e, and the 2 Guidry 2-P, 36-17s-18e. Loffland Brothers is also contractor for Tide Water Associated Oil Co. 4 Southdown Sugars, a 14,450-ft. wildcat southwest of present production in Terrebonne Parish, Louisiana's Hollywood gas field. The test will go down in 102-17s-17e.

Circle Drilling Co. of Lake Charles has been awarded contract for a new Aztec Oil & Gas Co. wildcat in Allen Parish, Louisiana, 3 miles south of one-well Clear Creek field. The 1 J. A. Bel et al. is located in 21-6s-7w.

H. L. Rowley, Inc., will seek production to 8,000 ft. at H. L. Rowley 1 Abner Maxwell, 36-3n-8e, Wilcox test 1 mile southwest of Shaw in southern Concordia Parish. The venture is 1⅝ miles north of Black Hawk, La.



ideal for drilling rigs

Wood's

oil, heat, water resistant v-belts

If your V-Belts are affected by static, oil, heat, or water we suggest you consult us. We won't offer any "cure-all" belts for these conditions, but we will offer belts designed and constructed to resist oil, heat, etc. to a varying degree. You'll get much longer belt life and have fewer expensive belt replacements. So before you order that next set of belts, consult us.

T. B. WOOD'S SONS COMPANY

1117 W. COMMERCE ST., DALLAS, TEXAS

PUT OIL TO WORK *with* SIMPLEX HYDRAULIC JACKS *and* PULLERS

- Pull Bits, Casings, Valve Seats, Bushings, Wheels
- Lift and Skid Rigs, Machinery
- Bend or Straighten Pipe

SIMPLEX Hydraulic Jacks

Single and double pump models from 3 to 100 tons capacity.

SIMPLEX - Jenny Hydraulic Pullers

"Center-Hole". Pulls or pushes. Models 30 — 100 tons capacity.

Re-Mo-Trol Remote Control Puller

Safer to use, operates in tight spots. For pushing or pulling. "Center-Hole" rams over 30 tons. 10-100 tons capacities.

WRITE FOR COMPLETE INFORMATION

Simplex Jacks

TEMPLETON, KENLY & CO.

2539 GARDNER ROAD, BROADVIEW, ILLINOIS

A. C. Templeton, 5627 Del Roy Drive, Dallas, Tex.

NATURAL GAS

Option Revealed

Colorado-Western deal told during bid for big pipeline

DENVER.—El Paso Natural Gas Co. has an option to buy two-thirds of the common stock of Colorado-Western Pipeline Co., which is waging a battle before the Colorado Public Utilities Commission to gain permission to lay a second big natural-gas line in the state.

Paul Kayser, El Paso Natural president, revealed the option to buy the large block of Colorado-Western stock during final hearings here before the commission.

Representatives of Colorado-Western also introduced as one of the last exhibits a contract with El Paso Natural by which the gas company agrees to supply gas to Western in case the latter's reserves prove insufficient.

The commission indicated it will be several weeks before it reaches a decision on the application.

The Colorado - Western line would cost an estimated $21,000,000 and would stretch about 328 miles from southwestern Colorado to Denver. The line was strongly opposed by Colorado Interstate Gas Co., which presently supplies major cities in the state with gas from the Texas Panhandle.

More opposition . . . Another opponent of the proposed line was Pacific Northwest Pipe Line Corp., which now has before the Federal Power Commission an application to lay a big-inch gas line from the San Juan basin of southwestern Colorado and northwestern New Mexico to the Pacific Northwest. Colorado Interstate plans to tap this line at Rock Springs, Wyo., to bring more gas to the Denver area.

Public Service Co. of Colorado, which buys gas wholesale from Colorado Interstate and markets it retail in Denver, also opposed the Colorado-Western application. Bruce MacCannon, Public Service engineer, disputed Colorado - Western's contention that Denver's gas supply is or has been inadequate. He also contended that gas supplied to his firm by Colorado-Western would cost about 43 cents per M.c.f., whereas additional gas from Colorado Interstate would cost only about 32 cents per M.c.f.

M. H. Gertz, consulting engineer for Colorado-Western, said his client would like to sell all or part of the gas it would transport from the Ignacio, Colo., area to Colorado Interstate. If this is not possible, he said, the company would seek other markets.

Program Completed for Annual P.C.G.A. Session

SAN FRANCISCO. — Program for the annual gas supply and transmission conference of the Pacific Coast Gas Association, to be held here May 12-13, has been announced by J. S. Hays, Pacific Gas & Electric Co., conference sponsor.

Papers to be given Wednesday morning, May 12, are: "Experience with the Shafer Main Line Valve Control," M. T. Taylor, Rockwell Manufacturing Co.; "Gas Pipeline Reserves from California Gas and Oil Fields," R. M. Bauer, Southern California Gas Co.; "Experience with Gas Turbine Compressor Stations," W. V. Holik, El Paso Natural Gas Co.; "Hydrostatic Testing, Economics, Problems, and Procedures," J. S. Powell, Southern California Gas Co., and N. K. Senatoroff, Southern Counties Gas Co.

Wednesday afternoon papers are: "Design and Construction Features of the Pacific Gas & Electric Co.'s 34-in. Pipeline," R. D. Smith, P. G. & E.; "Friction Factor Determination on the 34-in. Pipeline," J. J. Pugh, P. G. & E.; "Effect of the Tehachapi Earthquake on the 34-in. Pipeline," R. J. Lind, P. G. & E.; "Pipelines Ride the Shock Waves," A. B. Newby, Southern California Gas Co.

Thursday morning papers will be: "Report of the Transmission Procedures Committee," R. S. Nabors, P. G. & E., chairman; "Report on Progress Being Made by A.S.A. Subcommittee on Gas Transmission and Distribution Piping," F. A. Hough, Southern Counties Gas Co., chairman; and "Accident Prevention, Past and Present," W. S. Hyde, P. G. & E.

Ohio Lifts Most Controls On Household Gas Heating

COLUMBUS.—For the first time in several years, the Public Utilities Commission of Ohio has lifted practically all controls over household space heating units, authorizing most companies to eliminate their backlog of requests and fill new requests on a comparatively unlimited basis.

Minor controls remain on using natural gas for heating commercial and industrial establishments, but full controls were modified for household heating except in the Newark and Defiance areas. Virtually the only control on house heating in the remainder of the state is that written application be filed and that written approval be granted by the supply company.

Cut in Gas Rate Ordered

WASHINGTON.—Tennessee Natural Gas Lines, Inc., Nashville, Tenn., has been directed by the Federal Power Commission to file a rate schedule that will cut a proposed wholesale natural-gas rate increase from approximately $226,000 to $156,000 per year. The increase affects Tennessee Natural's affiliate and only interstate wholesale customer, Nashville Gas Co.

The company's proposed $226,683 increase was suspended by the FPC in September, but has been in effect subject to refund since March 1. Tennessee Natural is required to refund to Nashville Gas the difference between revenues based on rates allowed and those which it has been collecting subject to refund.

Natural Gasoline

Sun Completes Expansion Of Natural-Gasoline Plant

DALLAS.—Sun Oil Co. has completed an expansion of its Jameson natural-gasoline plant in Coke County, West Texas, boosting gas-handling capacity to 50,000,000 cu. ft. daily.

Main item in the expansion program, which has been almost continuous since 1948, was the installation of three new, 1,350-hp. supercharged compressor units. Additional water-treating and other equipment also was installed.

The Jameson plant is located about a mile south of Silver, Tex., in Jameson Strawn sand field. It extracts liquids from only about 25,000,000 cu. ft. of gas a day. All other gas, plus residue gas from that processed minus 10,000,000 cu. ft. sold to Lone Star Gas Co., is cycled back into the producing formation. The plant currently is operating at capacity.

Production is running about 40,000 gal. of natural gasoline and about 50,000 gal. of L.P.G. daily.

The new compressors bring the total installed since the plant was built in 1948 to nine units. The plant initially had only two. Together with the gradual addition of compressor units, a two-stage gathering system was laid in 1951 and all compressors supercharged by adding auxiliary blowers.

Steadfast in purpose

The ways of the old West were wild. In the 1860's there was no telegraph or railroad west of Missouri and nearly a month was required for communication to reach California. A more rapid exchange of news became a national necessity and as a solution the Pony Express was organized to carry the mail. And a great team it proved to be. Braving accurate Indian arrows, hazardous terrain and treacherous weather, the intrepid riders of the Pony Express wouldn't be stopped. They remained steadfast in their purpose to establish for the first time a seven-day mail run from the Mississippi River to the Pacific Coast. Maintenance of that schedule was truly a tribute to teamwork which won a fame for the Pony Express that time has not diminished.

Teamwork still has its place . . . especially in geophysical exploration. That's why General's capable crews, qualified by training and experience, have been able to help many operators locate conditions favorable to finding new oil reserves by accurately compiling and interpreting seismograph data. So when you plan to explore new areas and deeper horizons, let General's crews team up to help you.

WHEN YOUR CONTRACT IS WITH GENERAL, THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR.

A company wholly owned by its operating personnel

General GEOPHYSICAL COMPANY

GULF BUILDING • HOUSTON, TEXAS

EXPLORATION

Williston Has Rewarding First Quarter

by John C. McCaslin

DESPITE one of the worst winters in many years the Williston basin enjoyed a busy and profitable first quarter from the exploratory standpoint.

Bad weather failed to hinder the progress of significant exploratory developments during the remainder of the period, however. Both Montana and North Dakota chalked up important new strikes. South Dakota officially became a producing state. Saskatchewan in the Canadian portion of the basin got one of its best hits yet.

Montana . . . Sun Oil Co.-Eramont Petroleum et al. recovered apparently commercial quantities of oil on tests of their 1 Beagle Land & Livestock Co. in the North Sidney area of Richland County, indicating another discovery on a seismic prospect in the deep central portion of the basin.

The wildcat has been watched with great interest in recent weeks as a possible Madison (Mississippian) discovery in the area east of the long Cedar Creek anticline. There is no production at less than 10,000 ft. in this portion of Montana. The Madison tests were made at the 9,000-ft. level. Several showings have been logged in Mississippian formations in the general eastern Montana part of the basin, but previous showings east of the Cedar Creek anticline have been noncommercial.

The North Sidney wildcat is slated as a 12,500-ft. Ordovician test. It is located southeast of the Sun Oil Co.-Phillips Petroleum Co. Brorson area discovery which was the first deep success on a seismic prospect in the basin. The indicated North Sidney pool lies along a producing trend that appears to be developing from Fryburg pool in Billings County, North Dakota, to East Poplar, Montana, and east of the Cedar Creek anticline.

About 24 miles northwest of the town of Sidney, Sun Oil Co. and Phillips will test the Madison at 2 Dynneson in Brorson pool. The well is intended as a confirmation to the Ordovician Brorson discovery well, but the Madison will be evaluated.

The state's deepest production is at Brorson pool. The 1 Dynneson was the most significant strike in Montana last year. The well was finaled flowing 745 bbl. of oil per day from the Red River perforations at 12,585-12,605 ft. Total depth of the well is 12,671 ft., making it also the deepest hole in Montana. The Brorson area is 45 miles east of Richey production and 71 miles southwest of Beaver Lodge Nesson anticline production.

Big news was made in the Williston basin during the first 3 months of this year. Important developments are starred on the map. Pool names pertinent to the text are indicated by name.

Shell Oil Co. rounded out the first quarter in Montana by completion of the Cabin Creek confirmation well in Fallon County for 259 bbl. of oil per day. Production is from the Silurian. The well is a northwest offset to the Cabin Creek discovery, which was finaled for 244 bbl. of oil per day from Ordovician. The Cabin Creek opener had an estimated potential from both Silurian and Ordovician of 4,253 bbl. per day. It was also the first well to recover a significant showing of oil from the Mississippian on the Cedar Creek anticline. Shell is testing at another well ½ mile southeast.

North Dakota . . . Amerada Petroleum Corp. completed the first producer from Heath sandstone in the Williston basin at 1 Cheadle in Fryburg field, Billings County.

The new-pay discovery well was swabbed at the rate of 97 bbl. of oil per day and has since been shut in. It is the fourth well drilled in the field; the third to find Heath shows.

Stanolind Oil & Gas Co. completed 1 Starr, C SW SE 21-152n-94w, in the West Sanish area, McKenzie County, for a flow gage of 550 bbl. of oil per day through 12/64-in. choke. Production is from a sand not found in any other North Dakota wells and tentatively labeled Sanish sand. Age is basal Mississippian.

Amerada also recorded its tenth discovery in the state at 1 Lokken, 3 miles east of Tioga field in Mountrail County. The company reported a gage of 252 bbl. of oil per day from the Madison. The pool opener is reported lower structurally than Tioga field producers.

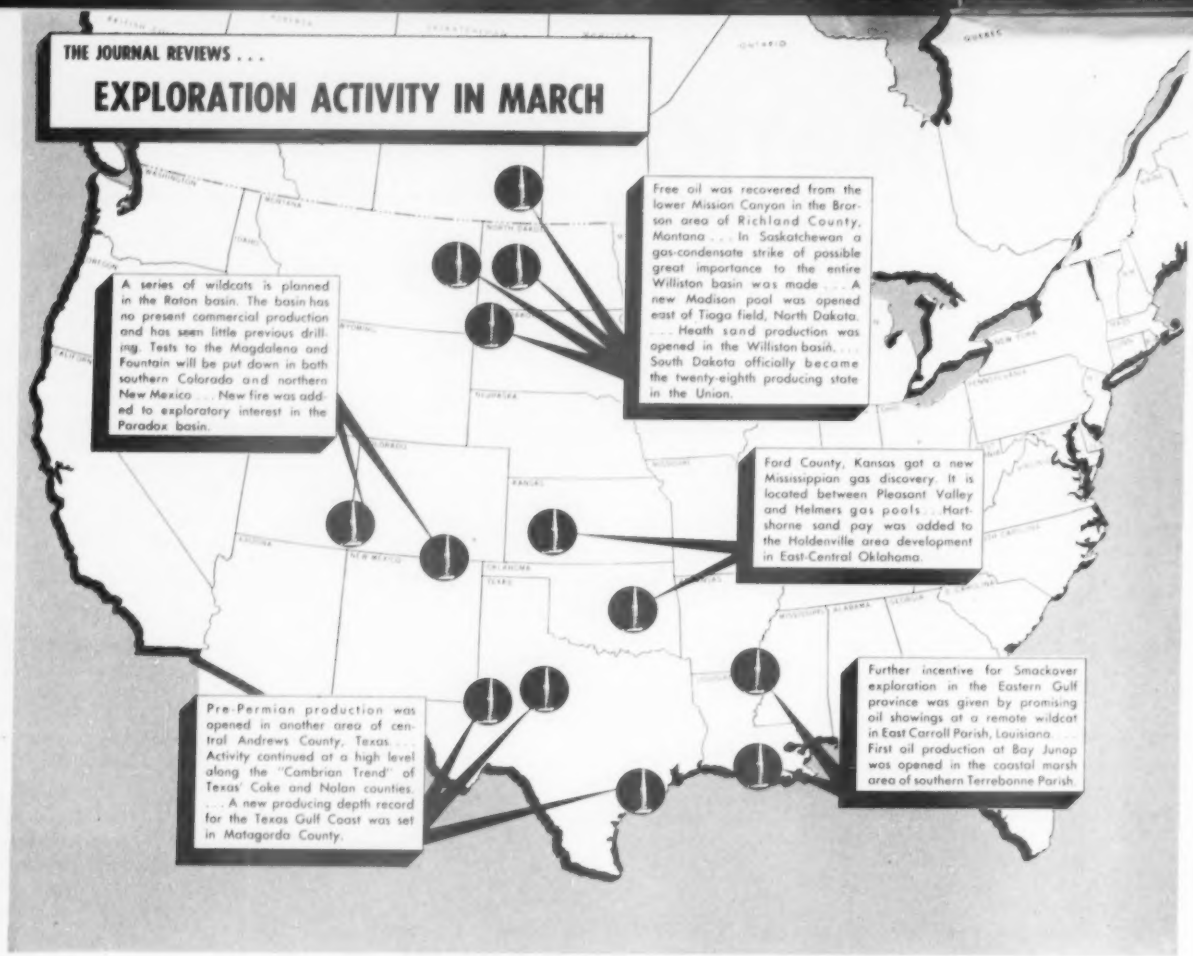
A new pool was opened 3 miles south of Beaver Lodge field by Amerada at 1 North Dakota F in Williams County. The discovery well was completed flowing 616 bbl. of oil per day from the Madison.

South Dakota . . . After a long period of testing, Shell opened first oil production in this state in northwestern Harding County.

The 1 State "A" was completed for a pump gage of 80 bbl. of oil per day from two zones in the Red River (Ordovician). The discovery is located in the Buffalo area of the county on the southern end of the Cedar Creek anticline. The second well in the area has reported recovery of oil and gas-cut water on Red River tests, indicating possible confirmation of the discovery.

Saskatchewan . . . The Canadian portion of the basin got what appears to be its most significant discovery to date during the first quarter.

Canadian Gulf Oil Co.-Canadian Devonian 9 Quinn in the Frobisher area of the province has indicated oil production in the Mission Canyon section of the Mississippian. The discovery is one of the best in the province to date on the basis of drill-stem tests. It flowed at the rate of 10,000 M.c.f. of wet gas per day. It is about 18 miles north of the international border, and 55 miles north of Nesson anticline production in North Dakota, lending considerable interest to exploration of the area between it and Beaver Lodge-Tioga oil production.


THE JOURNAL REVIEWS . . .
EXPLORATION ACTIVITY IN MARCH
A series of wildcats is planned in the Raton basin. The basin has no present commercial production and has seen little previous drilling. Tests to the Magdalena and Fountain will be put down in both southern Colorado and northern New Mexico . . . New fire was added to exploratory interest in the Paradox basin.
Free oil was recovered from the lower Mission Canyon in the Brorson area of Richland County, Montana . . . In Saskatchewan a gas-condensate strike of possible great importance to the entire Williston basin was made . . . A new Madison pool was opened east of Tioga field, North Dakota. . . . Heath sand production was opened in the Williston basin. . . . South Dakota officially became the twenty-eighth producing state in the Union.
Ford County, Kansas got a new Mississippian gas discovery. It is located between Pleasant Valley and Helmers gas pools . . . Hartshorne sand pay was added to the Holdenville area development in East-Central Oklahoma.
Further incentive for Smackover exploration in the Eastern Gulf province was given by promising oil showings at a remote wildcat in East Carroll Parish, Louisiana. . . . First oil production at Bay Junop was opened in the coastal marsh area of southern Terrebonne Parish.
Pre-Permian production was opened in another area of central Andrews County, Texas. . . . Activity continued at a high level along the "Cambrian Trend" of Texas' Coke and Nolan counties. . . . A new producing depth record for the Texas Gulf Coast was set in Matagorda County.

Completions Gain 17 Per Cent in First Quarter

by John C. McCaslin

TOTAL completions in the United States during the first quarter showed a 17 per cent gain over the previous year. Wildcat completions were down 39 wells, a decline of about 1 per cent from 1953 figures. Operators completed 4,388 wells in March, up 14 per cent over the previous month. Wildcatters finaled 818 tests, up 41 wells over February.

The map highlights the most significant developments of the month. They occurred in the Williston basin, southern Rocky Mountains, southwestern Kansas, East Central Oklahoma, West and West Central Texas, the Texas Gulf Coast, Louisiana Gulf Coast, and northeastern Louisiana.

Amerada Petroleum Corp. completed the first producer from Heath sand in the Williston basin at 1 Cheadle, Fryburg field, North Dakota. The Billings County well swabbed at the rate of 97 bbl. of oil per day, and has since been shut in. Several Heath (Big Snowy Group-Mississippian) shows have been reported through the basin, particularly at East Poplar field, Montana, but no previous commercial completions have been made.

Amerada reported a gage of 252 bbl. of oil per day on tests of 1 Lokken, new pool opener 3 miles east of Tioga field in Mountrail County, North Dakota. The discovery well is reported lower structurally than Tioga field wells. This is Amerada's tenth North Dakota discovery.

Sun Oil Co. and Phillips Petroleum Co. recovered free oil on test of the lower Mission Canyon (Mississippian) at their 2 Dynneson in Richland County, Montana. Sun-Eramont et al. have another possible Mission Canyon strike 6½ miles southeast. These two indicated discoveries in the heretofore Ordovician - producing area promise further exploration for the shallower Mission Canyon throughout the Brorson area of Montana.

Canadian Gulf-Canadian Devonian 9 Quinn, about 55 miles north of North Dakota Nesson anticline production, flowed at the rate of 10,000 M.c.f. of gas per day with distillate from the Mission Canyon. The well is about 18 miles north of the international border, lending interest to the area between it and Beaver Lodge-Tioga oil production.

Shell Oil Co. completed 1 State "A," Harding County, South Dakota, discovery, opening officially first production in that state. The strike pumped 80 bbl. of 31°-gravity oil per day from two zones in the Red River (Ordovician).

Continental Oil Co. announced location for the first of a series of Raton basin wildcats. Location for the first test will be 12 miles west of Raton in Colfax County, New Mexico. A part of the six-well program will be to the Dakota. The first wildcat will go to the Magdalena (Pennsylvanian) at about

Total March Completions, Exploration and Development

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Rigs and drilling
Ala.-Ga.-Fla.	9	0	0	9	1	2	4	1	0	1	54,406	9
Arkansas	55	31	2	22	14	31	6	4	0	0	206,454	41
California	216	161	3	52	45	92	50	15	12	2	990,846	239
Colorado	94	48	4	42	0	6	84	4	0	0	531,365	119
Illinois	192	100	1	91	53	139	0	0	0	0	496,635	387
Indiana	74	25	0	49	70	4	0	0	0	0	105,343	102
Kansas	375	194	48	133	36	329	10	0	0	0	1,254,817	404
Kentucky	90	48	15	27	68	22	0	0	0	0	179,617	78
Louisiana	288	210	12	66	110	23	24	50	57	24	1,818,794	350
North	146	112	9	25	109	17	12	7	1	0	374,481	143
South	142	98	3	41	1	6	12	43	56	24	1,444,313	207
Michigan	55	25	1	29	29	17	9	0	0	0	152,890	110
Mississippi	30	11	1	18	1	2	21	4	2	0	200,790	35
Montana	21	10	1	10	5	9	3	3	1	0	95,898	31
Nebraska	27	9	2	16	1	6	20	0	0	0	145,048	28
New Mexico	81	54	15	12	11	28	15	11	12	4	506,763	106
New York	51	25	1	25	51	0	0	0	0	0	34,771	45
North Dakota	15	13	0	2	0	1	0	13	1	0	126,370	29
Ohio	104	44	20	40	64	38	2	0	0	0	206,156	187
Oklahoma	789	494	19	276	318	346	86	27	9	3	2,617,966	704
Pennsylvania	70	17	27	26	36	11	23	0	0	0	209,279	165
South Dakota	1	0	0	1	0	0	0	1	0	0	8,569	5
Texas	1,577	950	86	541	353	576	436	147	45	20	7,389,117	1,250
N. Central (7-B & 9)	495	348	9	237	239	239	113	2	1	0	1,974,099	300
West (7-C & 8)	376	274	7	95	33	140	118	46	23	16	2,174,589	437
Panhandle (10)	71	46	12	13	7	58	6	0	0	0	241,403	53
East (5 & 6)	93	35	23	35	13	22	44	13	0	1	515,322	84
Gulf Coast (2 & 3)	240	130	20	90	15	46	97	62	17	3	1,581,646	191
Southwest (1 & 4)	203	117	15	71	46	71	58	24	4	0	902,058	185
Utah	6	1	1	4	0	2	2	2	0	0	34,814	30
West Virginia	53	2	41	10	19	33	1	0	0	0	162,524	162
Wyoming	114	91	4	19	10	27	65	7	5	0	651,615	106
Miscellaneous	§1	0	0	1	0	1	0	0	0	0	4,498	¶14
Total Mar. 1954	4,388	‡2,563	304	*1,521	1,295	1,745	861	289	144	54	18,185,355	14,736
Total Feb. 1954	3,837	2,169	264	1,404	1,190	1,446	731	294	122	54	16,134,168	4,529
Cumulative 1954	12,931	7,331	989	4,702	3,798	5,155	2,450	969	395	164	53,917,406	
Cumulative 1953	10,978	5,581	838	4,559	3,221	4,545	1,937	859	327	89	45,351,276	
Western Canada	179	104	7	68							735,336	
Alberta	113	70	5	38							536,162	
Saskatchewan	45	19	1	25							142,981	
Manitoba	19	15	0	4							46,850	
B. C.-N.W.T.	2	0	1	1							9,343	

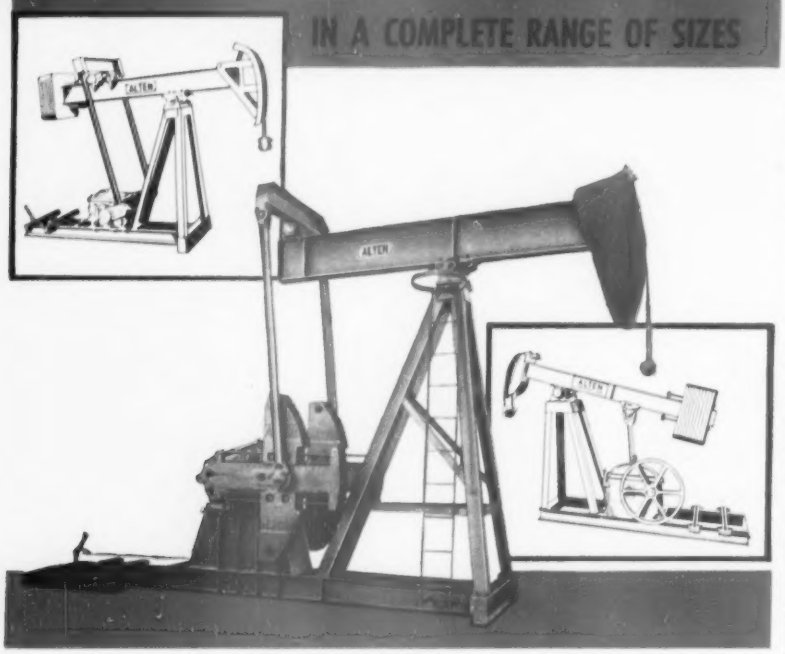
*Incl. 86 service wells: Calif. 2, Kans. 4, N. Y. 25, Ohio 5, Okla. 32, Pa. 18. ‡Incl. 61 condensate wells: Calif. 1, S. La. 21, Miss. 1, Okla. 9, E. Tex. 1, Gulf Coast 16, S.W. Tex. 12. †Incl. all wells rigged up and/or drilling at month's end. §Incl. 1 Nevada wildcat. ¶Incl. Nev. 11, Md. 3.

. . . the Month's Wildcats

	Total	Oil	Gas	Dry	Footage	1954 Comp.	1954 (1,000 ft.)	1953 Comp.	1953 (1,000 ft.)
Ala.-Ga.-Fla.	9	0	0	9	54,406	27	152	26	139
Arkansas	11	2	0	9	47,864	31	110	27	128
California	57	9	1	47	269,516	156	754	161	748
Colo.-Utah-Wyo.-Mont.	65	8	1	56	372,062	200	1,157	146	828
Tri-States	66	7	0	59	116,438	183	340	205	408
Kansas	53	9	2	42	202,469	148	574	224	832
Louisiana	44	20	2	22	407,090	121	1,167	108	933
North	14	1	1	12	75,069	28	157	36	213
South	30	19	1	10	332,021	93	1,010	72	720
Michigan	24	3	0	21	50,104	73	157	59	149
Mississippi	11	0	0	11	69,470	34	221	57	429
Nebraska	10	2	0	8	48,374	29	154	32	167
New Mexico	10	4	0	6	88,754	47	399	45	280
North Dakota	4	2	0	2	33,506	14	67	12	68
Oklahoma	64	10	2	52	274,925	193	866	176	817
South Dakota	1	0	0	1	8,569	4	20	1	5
Texas	379	59	13	307	1,970,624	1,275	6,451	1,292	6,310
North Central	142	22	3	117	541,102	508	1,800	536	1,923
West	83	21	3	59	467,519	262	1,547	199	1,190
Panhandle	5	0	0	5	29,350	18	115	11	52
East	27	2	0	25	155,643	64	392	73	349
Gulf Coast	65	6	4	55	498,130	210	1,593	222	1,579
Southwest	57	8	3	46	278,880	213	1,004	251	1,217
Others	10	0	4	6	41,951	30	133	33	129
Total March 1954	818	135	25	658	4,056,122	2,565	12,722	2,604	12,370
Total February 1954	777	111	26	640	4,001,421				
Cumulative 1954	2,565	382	76	2,107	12,722,394	2,565	12,722		
Cumulative 1953	2,604	377	90	2,137	12,370,109			2,604	12,370

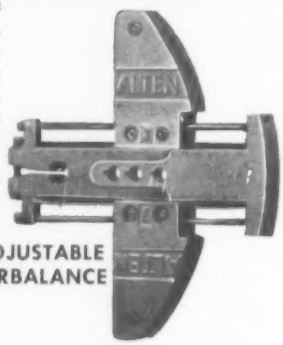
ANNOUNCING NEW PRE-TESTED ALTEN PUMPING UNITS

IN A COMPLETE RANGE OF SIZES



Wherever there is a need for pumping oil, Alten has a unit of ample capacity to do the job. *Alten now makes every size and makes it better.* . . . Better because Alten units spend more time operating and less time idled for repairs, maintenance and service. Every part is built for longer life and quick, easy servicing.

All these features can't be shown on this page, so why not take this friendly suggestion: *Be Sure To Compare Alten Before You Buy!*

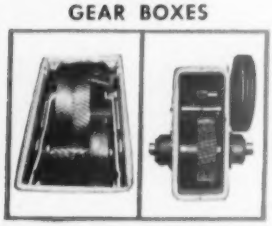


NEW ADJUSTABLE COUNTERBALANCE

Rugged enough to meet harshest oil field requirements, yet so amazingly simple it can be adjusted in minutes by one man on the ground.

Crank calibration locates weights for desired counterbalance. Weights cannot fall during adjustments — they are safely locked in position at all times.

TWO GREAT GEAR BOXES



Some pumping situations demand herringbone gears for peak performance, others helical. *Only Alten offers both.* No need to compromise — get the proper gear train every time.

4 WAY ADJUSTABLE SADDLE — BRONZE BUSHED BEARING

Matchless for long wear and convenience. Simply rotate to a new bearing surface and obtain several times ordinary life. Walking beam may be adjusted laterally and to and from the well for exact centering.

BUY FROM YOUR LOCAL SUPPLY STORE

— ALTEN —
Foundry & Machine Works, Inc.
LANCASTER, OHIO

7,000 ft. The same company will also drill on the Maxwell Land Grant in southern Colorado. Two wells will be drilled to the Fountain in this area.

Three States Natural Gas Co. 2 White, Dove Creek field, Montezuma County, Colorado, flowed 142 bbl. of 48°-gravity oil per day on drill-stem test to shift Colorado exploratory interest into the Paradox basin. This new strike is the second in the basin this year. The same company also made a discovery in San Juan County, Utah, recently. The Utah strike was the first indicated commercial production for the southeastern Utah portion of the basin. Drilling at Dove Creek previously had met with little success since its discovery in 1948.

City Products Corp. opened a new Mississippian gas pool in the Ford County area of southwestern Kansas at 1 Vice. The strike gaged an estimated 10,000 M.c.f. of gas per day.

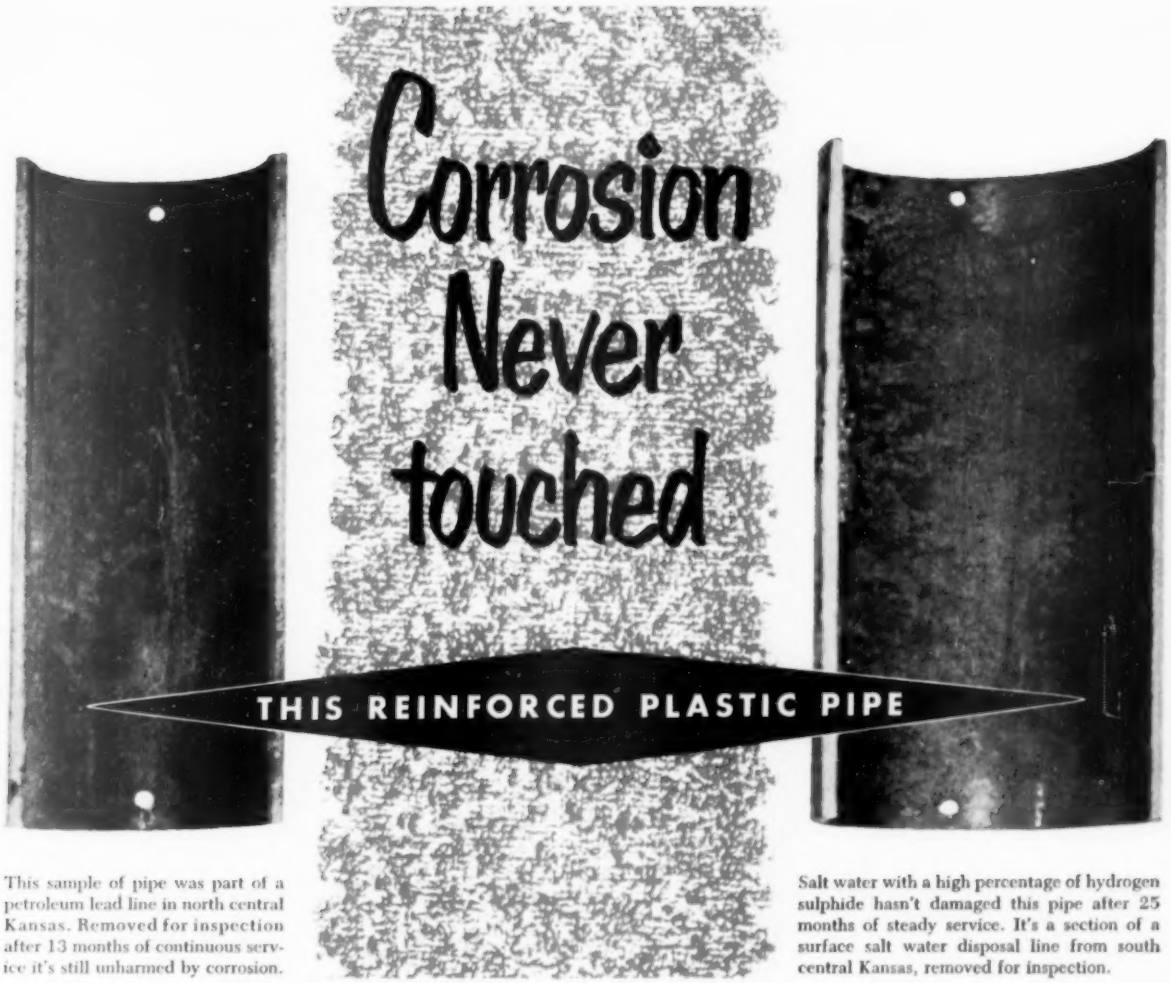
Leta M. Chapman added Hartshorne sand pay at 7 Bruner in Grief Creek pool's west side, Hughes County, Oklahoma. The discovery adds new hope that the Hartshorne sand may lie under the entire area. Most production in the area is from the Booch sand. The revival in the area has expanded Grief Creek pool up to the city limits of Holdenville, and the first well inside the city was spudded late in the month.

Ralph Lowe 1 Deep Rock was completed in Andrews County, Texas, flowing 407 bbl. of oil daily from 69 ft. of Ellenburger pay. The new strike is located in an area that has been under intensive geological study since discovery of Andrews-Wolfcamp field, with its 1,000-bbl. wells, just west of Andrews.

Skelly Oil Co. 3-B Boyd, North Dora field well, was completed for an initial potential of 1,987 bbl. of oil per day from the Cambrian, opening another area for that formation. Neville G. Penrose 1 Kirk, 1 mile east of Blackwell in southern Nolan County, became a new Cambrian discovery along the "trend." As a Cambrian producer, it marks the fifth area in that pay along the new trend of fields.

Stanolind Oil & Gas Co. completed a 13,000-ft. gas-condensate well at a wildcat 10 miles southeast of Bay City, Tex., giving the Texas Gulf Coast a new producing depth record. Productive interval of the well is 13,048-68 ft. in the Frio sand. Previous deepest production on the coast was in Chocolate Bayou field, Brazoria County. The new well is the deepest production in the state, outside West Texas.

The Texas Co. and Union Oil Co. of California's Bay Junop wildcat opened first oil production at the long-explored salt dome 35 miles southwest



This sample of pipe was part of a petroleum lead line in north central Kansas. Removed for inspection after 13 months of continuous service it's still unharmed by corrosion.

Salt water with a high percentage of hydrogen sulphide hasn't damaged this pipe after 25 months of steady service. It's a section of a surface salt water disposal line from south central Kansas, removed for inspection.

Sour crudes and salt water can eat up a lot of ordinary pipe. But look at these sections of pipe, removed for inspection, after 13 and 25 months of service—corrosion never touched them. They're "Fibercast" reinforced plastic pipe . . . made of BAKELITE Polyester Resins reinforced with glass fiber.

"Fibercast" pipe is presently used to handle salt solutions, hydrogen sulphide, dilute acids and alkalies and acid muds. Coating, wrapping or cathodic protection are unnecessary.

The smooth surface of pipe made of BAKELITE Polyester Resins and glass fiber cuts paraffin build-up. You get less back-pressure, surging, and settling, and can use smaller diameter pipe than usual.

"Fibercast" pipe in 3½" sections weighs only about a pound per foot. This extremely light weight makes handling and installation easy. One company reported running joints as fast as one a minute. Installation requires no special tools; you can cut this pipe easily with a hacksaw.

Among the other advantages of reinforced plastic pipe is its high strength-weight ratio. It won't shatter. It has good thermal and electrical insulating qualities, and about the same coefficient of expansion as steel.

"Fibercast" reinforced plastic pipe—made of BAKELITE *Polyester Resins and glass fiber—is a product of Fibercast Corporation, Sand Springs, Okla. It is distributed by the Youngstown Steel Products Co., the Continental Supply Co., and the Youngstown Steel Products Co. of California.*

BAKELITE
TRADE-MARK
POLYESTER RESINS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company
Division of Union Carbide Canada Limited
Belleville, Ontario

of Houma, La. Discovery of gas and condensate climaxed 24 years of exploration and the drilling of 29 tests on and around the dome.

The California Co. 1 Greeson recovered Smackover shows in a practically nonproductive area of the Mississippi embayment. Nearest Smackover production to the East Carroll Parish wildcat is in southern Arkansas fields, about 100 miles northwest. An increased Smackover search has been evident in the past few months throughout the eastern Gulf Province.

MISSISSIPPI

Honolulu Oil Corp. will run potential test soon at its new gas strike in the Black Warrior basin, the 1 Davis, 22-12s-1e, Calhoun County.

After acid treatment of open hole at 3,274-3,305 ft. the well flowed an unestimated amount of gas through ¼-in. choke. Open hole was then sand-oil treated and then it cleaned to pits on ½-in. choke. At last report the well was being flowed to pits on ¼-in. choke.

Maxie Field Area

The Ohio Oil Co. will test Unit SE-41 No. 1-T, 7-1s-12w, on the south side of Maxie field in Forrest County.

Log indicated that the well cut a 60-ft. fault in the chalk at 6,550 ft. and a 200-ft. fault at 8,190 ft. which cut out the bottom part of the marine Tuscaloosa and the top part of the lower Tuscaloosa. The log and cores indicate gas sands in the Eutaw and lower Tuscaloosa, making a total of 58 ft. of gas sand in the well.

The test establishes production on the south or upthrown side of the fault on the south side of Maxie field.

LOUISIANA

SOUTH LOUISIANA

Potential Due at Beauregard Strike

Magnolia Petroleum Co. will run potential at 1-G Long Bell Lumber Co., new oil discovery about 3 miles east of Cow Pen Creek field in Beauregard Parish.

The discovery flowed 140 bbl. of 51.7°-gravity oil plus 1,460 M.c.f. of gas per day through 12/64-in. choke from perforations at 8,802-10 ft. Well is located in 8-6s-8w.

New Deep Gas Pay At Vermilion Field

A new deep gas pay in West Lake field, Vermilion Parish, has been uncovered by Union Oil Co. of California at 4-B State Lease 540 et al, 14s-2w.

The well was completed through perforations at 12,370-390 ft. The well flowed an estimated 5,000 M.c.f. of gas per day on ¼-in. chokes. It is the deepest producing well in the field.

Texas Gulf Coast New Pay in Harris

New oil pay has been indicated for the Alco-Mag area of Harris County by Chas. B. Wrightsman and Pat R. Rutherford at 2 Harris County Land & Improvement Co. Operators are coring ahead for more shows.

A drill-stem test was run in the Yegua from 8,048-56 ft. and recovery was 2,103 ft. of 40°-gravity pipeline oil. The discovery is on Lot 17, Victor Blanco Survey, A-2.

Russell Maguire opened the area at 1 Dooley last year. Gas-distillate pay was proved from 8,928-31 ft.

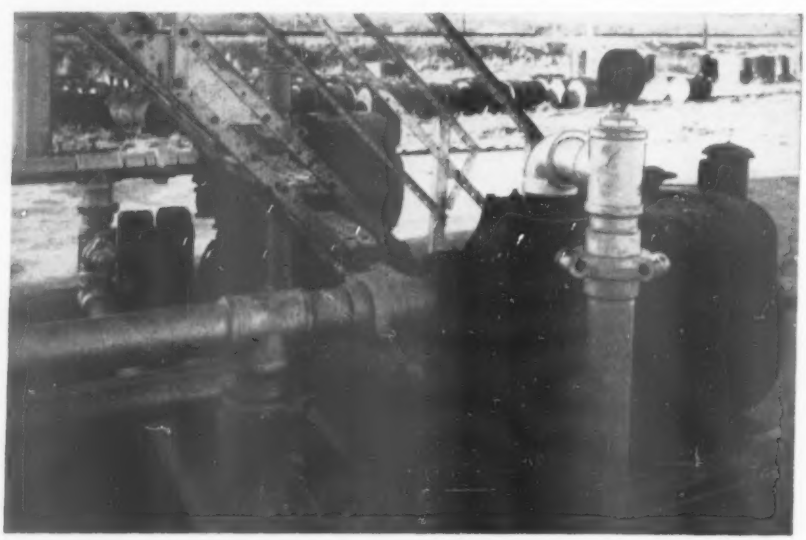
Lafayette Discovery Flow Gas-Condensate

A wildcat gas and gas-distillate discovery on a 4,750-acre block in Lafayette Parish, Louisiana, was announced by Sunray Oil Corp. in a joint exploratory venture with Buffalo Oil Co.

The companies report an estimated open flow potential of 20,000 M.c.f. of gas per day with production of a high gravity distillate at an approximate rate of 20 bbl. per million ft. of gas.

The new discovery is the 1 Mary McConnell, Section 8-10s-3e, Lafayette Parish, 3 miles in a southerly direction from the town of Duson.

The new well has been drilled to a total depth of 10,735 ft. and indicates multiple-zone production possibilities. Sunray and Buffalo will start a second well immediately to test acreage to a greater depth, probably as deep as 12,000 ft.



Pumps

. . . . FOR THE OIL INDUSTRY

Exclusive twin priming advantages give C.M.C. Dual Prime Pumps longer life, minimum maintenance and outstanding operating performance.

They are simple, rugged, fool-proof—and every pump is tested under most severe conditions.

Automatic priming speed on lifts up to 25′ is unmatched. Sizes 1½″ to 10″—3,000 to 240,000 G.P.H.

Write today for full details — our qualified engineers will gladly help solve your pump problems.

Two C.M.C. Dual Prime Model 420 Pumps loading lub-oil for Mid-Continent Petroleum Corporation at Odessa, Texas

CONSTRUCTION MACHINERY COMPANIES
WATERLOO, IOWA

CANADA

Pump Will Be Set Up At North Drumheller Well

Pump unit will be installed at the Socony-Anglo-C. W. N. G. 1 North Drumheller basal Blairmore oil discovery well, following completion of swabbing tests. During swab tests the discovery indicated an initial potential of 36 bbl. daily. Gravity of the oil is 24°.

This project lies on the southwest side of Drumheller oil field, 60 miles northeast of Calgary.

The 1 North Drumheller, LSD 14, 23-29-20w4, is ¾ of a mile southwest of the Imperial 8-16 H.B. abandonment, 1 mile southwest of D2 oil production and about 2 miles southwest of Cretaceous oil wells. The production is coming from the perforated interval 4,362-72 ft. in the basal Blairmore. The well's total depth is 5,560 ft., and string of 7-in. casing was set at 4,450 ft.

Manitoba . . . British-American Oil Co., Ltd., has commenced production tests at its Mississippian limestone oil discovery well in the Woodnorth area of southwest Manitoba, and flowed at the rate of about 72 bbl. daily. However, approximately one-third of that fluid was b.s. and w., thus actual net oil was about 48 bbl. daily. Gravity of the oil is about 35°.

This well, on a quarter section farmout from Canadian Superior Oil of California, Ltd., is B.A.-Canadian Superior 1 Woodnorth, LSD 3, 33-8-27w1, 11 miles south-southwest of Virden town, 6 miles southeast of Daly oil field.

The 1 Woodnorth entered the Mississippian at 2,413 ft., or 863 ft. subsea. Drill-stem tests in that formation gave up varying amounts of oil and water, and production string of casing was set at 2,687 ft. The following intervals were perforated: 2,506-10 ft., with 4 shots per ft., and 2,469-71 ft., with 4 shots per ft. Initial swab test was run, and the well flowed 30 bbl. in 10 hours, for the 72-bbl.-per day rate—a net 48 bbl. of oil daily. Swab testing is being continued.

Unity gas field . . . Bata Petroleums Ltd., has found a sizable flow of natural gas in the Unity sand (basal Cretaceous) at its driller in Unity gas field in southwest Saskatchewan, a venture that earlier this month had also discovered gas in the Viking.

The dual zone gasser B-3-24 Bata, LSD 3, 24-39-23w3, is ⅜ of a mile northeast of the 7 Bata Unity sand gas well, ½ mile south of 4 Bata gas well, and about 45 miles southwest of North Battleford.

The Unity gas sand was topped at 2,096 ft., or 118 ft. subsea (K.B. elevation 1,978 ft.), and a 2-hour drill-stem test through a ⅝-in. choke was run in the interval 2,095 to 2,103 ft. Natural gas flowed to the surface immediately at maximum rate of 3,700,000 cu. ft. daily, holding at that rate throughout test. There was no fluid recovery. Crew is now running string of production casing.

The Viking was entered at 1,660 ft., and a 30-minute test in that formation, through a ⅝-in. choke, flowed gas in 1 minute at maximum rate 1,300,000 cu. ft. daily. Bata officials also stated that a third gas sand was indicated below the Viking.

Rocky Mountain House . . . The team that discovered light-gravity crude oil in the Rocky Mountain House area of southern Alberta has site staked for the first follow-up to that discovery well.

The next driller will be Superior et al 8-27 Rocky Mountain House, LSD 8, 27-42-8w5, ⅝ mile southeast of the No. 10-27 discovery

Insurance against wash-outs

The best insurance against wash-outs is a well sealed joint. You can depend on 'Bestolife Lead Seal Tool Joint and Casing Compound to give a perfect seal, without seizing or galling.

The Standard of the Oil Country for over 20 years. Unconditionally guaranteed. Sold at supply houses throughout the world. Packed in 1¼, 5, 20 and 50 lb. containers.

I. H. GRANCELL
1601 E. NADEAU STREET, LOS ANGELES 1, CALIF.

means top quality
...Swepco quality

Call for ASTM Specification A358-52T and rest assured you're getting the best obtainable in welded austenitic heavy walled pipe.

Higher stress values

This specification demands qualified operators and rigorously exact procedures. It covers every aspect of manufacture and insures complete quality control. An important advantage is that pipe has higher stress values in design.

You buy with confidence because it must be right!

It will pay you to look into this "spec"—a free copy is yours for the asking from SWEPCO, which has long been meeting the high standards set by this and other codes.

Swepco pipe, tubing and welding fittings, 3" to 48" O.D., are obtainable in stainless steel, nickel alloys, titanium, Carpenter "20", Hastelloy alloy, other alloys. Lengths up to 20 feet; extra heavy schedules and with high cylinder finishes.

MAIL THE COUPON TODAY!

Stainless Welded Products INC.
JERSEY CITY 2, N. J.
Tel.: HEnderson 5-0123
Distributors in Principal Cities

Stainless Welded Products, Inc.
250 Cornelison Avenue, Jersey City 2, N. J.

☐ Please send copy of ASTM specification A358-52T.
☐ Please send illustrated Catalog and Engineering Data Tables.

Name & Title
Company
Street
City Zone State

well. Contractor will again be New Superior, who will use rig from the discovery. Hole will go down to test the Cardium that proved productive at the 10-27 wildcat.

Meanwhile, the discovery well is continuing production flow tests, and is being produced at the rate of approximately 50-70 bbl. of oil per day. However, a fire broke out at the well and destroyed and damaged some of the rotary equipment prior to being extinguished. Crew of the New Superior rig is currently repairing equipment and will move to the follow-up site as soon as repairs have been completed.

KANSAS

Oil Shows Tested At Haskell Wildcat

Helmerich & Payne have tested shows of oil at a deep test 11 miles southwest of Beyer pool in Haskell County. The 1 Jones, C SW SW 4-27s-34w, recovered 5 ft. free oil, 20 ft. muddy oil, 50 ft. oil and gas-cut mud on drill-stem test in the lower Kansas City lime at 4,387-4,410 ft. Successful completion at the wildcat would open first oil production for the county.

Bennett & Roberts are rigging up rotary tools at another deep test in southeastern Haskell County, the 1 Boatright, SE SE SE 13-29s-32w. The wildcat is located on the east edge of Hugoton gas field, 5 miles northeast of Sublette, Kansas.

Kingman Discovery

M. B. Armer and Midstates Oil Corp. are drilling ahead below 4,390 ft. after recovery of 2,670 ft. of oil from the Kansas City lime at their 1 Davis, NE SE SE 3-29s-6w.

The wildcat is located 4 miles west of new Orsemus pool in eastern Kingman County.

New Barber Pool

GMR Oil Co. and Lion Oil Co. report an open flow gage of 9,200 M.c.f. of gas per day at 1 Lenkner, SW NE SW 24-33s-14w, wildcat 1½ miles west of Medicine Lodge pool in central Barber County. Production is from Mississippian.

MICHIGAN

A new Traverse oil discovery well was being credited to Merrill Drilling Co. and associates for Monterey Township, Allegan County.

This new producer, the 1 Arndt SE NE SW 2-3n-13w, if and when it is officially completed as a new pool opener will boost the number of Traverse oil discoveries in Monterey Township to an even dozen—probably the township with the most separate discoveries in Michigan.

The 1 Arndt logged Traverse lime at 1,688 ft. Hole was bottomed out in pay, which filled 400 ft. with free oil natural in 37 hours, at 1,691 ft. Pay showed at 1,690-91 ft. Although it is structurally lower than many surrounding control points, the oil pay in this wildcat was found from 5 to 7 ft. above the water table as reflected in many of these previous tests. Well responded satisfactorily to a 500-gallon acid treatment, showing a net oil recovery of 80 bbl. in the first 12 hours, pumping and flowing on machine test. After pumping unit had been installed, production continued to average about 6 bbl. of oil an

The Oil and Gas Journal's TIME SAVER Card is designed to give Journal readers One-Stop Service in securing more data from its Advertisers.

Instead of writing a letter to each of those Advertisers, remove one of the cards from the yellow page you'll find in this issue—keep it beside you as you go through this issue.

As you see an Advertisement that interests you, jot down the page number, complete it as directed and send it to us. We'll see that you get more information.

THAT'S ONE-STOP SERVICE

hour, but late reports indicated the possible presence of a water-cut after the first 24 hours.

This is Merrill's second test well in this area in the past year. Although drilling block in the deal was reported to consist of from 700 to 800 acres, most geologists gave the prospect, at best, limit of from 120 to 320 acres. The later report of a water-cut may dampen prospects to some extent, and although it was yet too early to accurately evaluate this cut, at the present it did not appear to be too serious. No follow-up locations had been announced.

KENTUCKY

EASTERN KENTUCKY

In Magoffin County and located on Bates Lick Branch, Howard Jenkins has completed 1 Elliott Wireman for 300,000 cu. ft. of gas daily from Pennsylvanian salt sand at a total depth of 1,042 ft.

In Big Sandy gas field and located on Raccoon Creek in Pike County, Kentucky West Virginia Gas Co. have completed 1014 Flora Goff for 207,000 cu. ft. of gas daily from Devonian brown shale 3,030 to 3,820 ft. total depth. Well was shot with 8,000 lb. of gelatin.

APPALACHIAN AREA

PENNSYLVANIA

A deep rank wildcat test is being promoted in Kiskiminetas Township, Armstrong County, southwest Pennsylvania. It is proposed to be drilled on the William M. Schrecengost farm by Fred M. Schrecengost. The farm is on the Elders Ridge Quadrangle about 1¼ miles northwest of the town of Avonmore on the Roaring Run anticline. The estimated depth will be approximately 12,500 ft. and is expected to penetrate the Gatesburg formation.

In Buffalo Township, Washington County, Manufacturers Light & Heat Co. has taken over Washington Oil Co. 1 Kelly Southerland and intend to drill it to the Medina sand. The original drilling shut down at 7,184 ft. The Oriskany sand was reached at 7,093 ft., and recorded water at 7,130 ft. The additional drilling will go to approximately 12,000 ft. Pine Township, Indiana County, Charles E. Fralich completed 1 Charles Liesowity wildcat gaging 500,000 cu. ft. gas, Oriskany sand 8-146-8,158 ft., gas 8,146 ft. Total depth 8,166 ft.

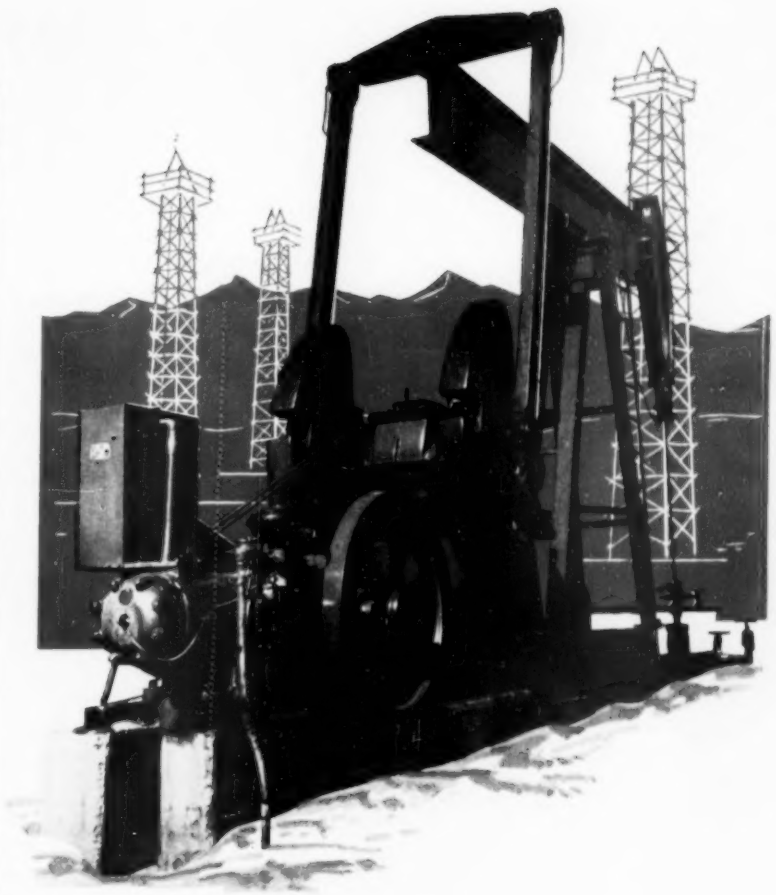
WEST VIRGINIA

Union district, Preston County, West Virginia, Columbian Carbon Co. completed 1-1196 Robert Breedlove wildcat, elevation 2,546 ft., after Hydrofrac treatment with a small show of gas, finished at 4,727,000 cu. ft, with a rock pressure of 1,860 psi. in 15 hours, chert 4,777 ft., gas 4,817 ft., Oriskany sand 4,922 ft. Total depth 5,050 ft.

OHIO

Wiser Oil Co. moved ½ mile northwest of the 1 Sweeney and brought in the second Oriskany sand gasser in the new pool in south central Royalton Township, Cuyahoga County. On 1 John Zajicek, Section 15, with sand at 1,750-1,755 ft. and 1,789-1,815 ft., the open flow was 950,000 cu. ft. natural.

A second producer confirms a new pool in northwest Fallsbury Township, Licking County. Mid East Oil Co. 1 Pearl Bates, Section 6, logged the Clinton sand at 3,055-3,100 ft., and made 165 bbl. in 24 hours after frac-



for sheer guts

YOU CAN'T BEAT A LORAIN!

In any climate, in any weather Lorain engines and compressors have proved that they have what it takes to stay on the job.

What's more, they need little attention. Repairs are easily made on the spot. Even the wet cylinder liners can be changed in the field without special tools or equipment.

Lorain Muti-Fuel Engines are available from 20 to 75 HP. Try one on your toughest job and see the difference.

A-9325

WHITE-ROTH Machine Corp. LORAIN, OHIO

turing. Two additions to the New Castle pool in Coshocton County found rich pays. In the northeast extension, Mossholder Drilling Co. 5 Harley Williams, Third Qr., found sand at 3,297-3,365 ft., and produced 300 bbl. in 24 hours after fracturing. In the northwest extension, Mammouth Drilling Co. 1 Ida Ringwalt made 241 bbl. in 24 hours after fracturing sand at 3,162-3,209 ft.

TEXAS

SOUTHWEST TEXAS

Colhoun Has New Pay

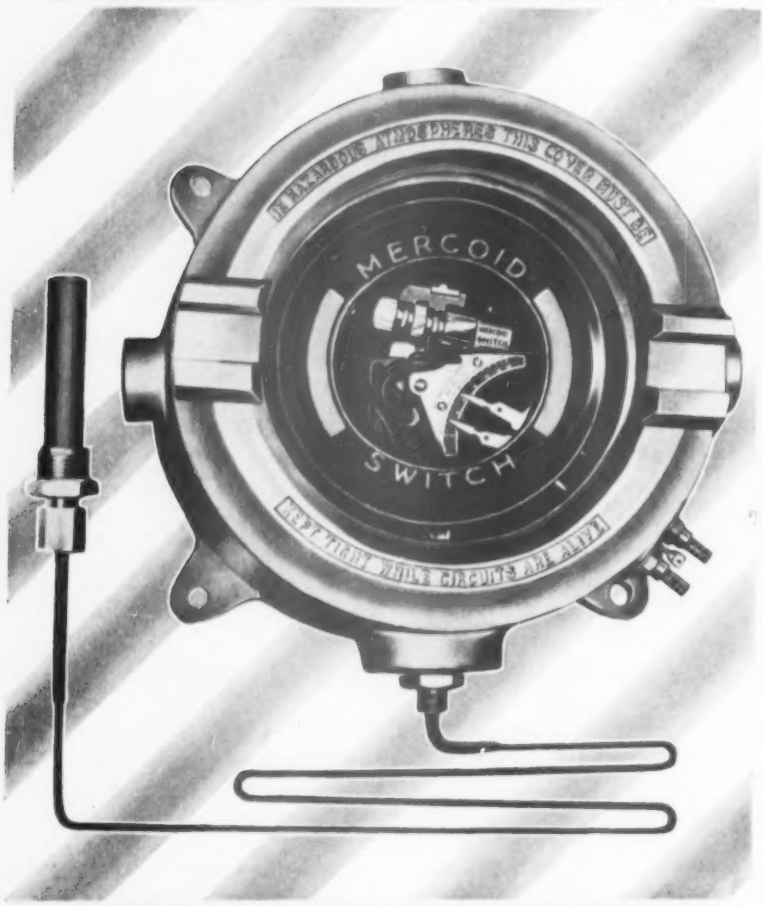
H. R. Smith 1 Welder, in Jay Welder oil field, south-central Calhoun County, opened a new gas-condensate pay from 5,814-26 ft.

Recovery was 85 ft. of distillate, 650 ft. of mud-cut water and 150 ft. of distillate-cut mud on drill-stem test of open hole. The 1 Welder is in the E. Hidalgo Survey, A-21.

Coronado Corp. (now Stanolind) opened Jay Welder field in 1940. The discovery well, 1 Welder, finaled for 200 bbl. of oil per day from Catahoula perforations at 5,634-67 ft. There are five oil wells producing in the field with a total allowable of 83 bbl. daily.

Official Gage Run At Brazoria Discovery

Reynolds Mining Corp. has run official state potential at 1 Burrows et al, new Brazoria County oil discovery, opening Lurey field.



TEMPERATURE PROTECTION

Mercoid Remote Stem Temperature Controls are extensively used on major pipelines throughout the oil industry.

Wherever low or high temperature conditions are encountered, such as in pump cases—in motor and pump bearings—in speed increaser lube oil systems—or in many other vital locations — Mercoid mercury switch equipped controls are constantly on guard.

Let Mercoid solve your temperature control problems

THE MERCOID CORPORATION, 4201 BELMONT AVE. CHICAGO 41, ILL.
205 E. 42nd St., New York • 3137 N. Broad St. Philadelphia

The well was drilled to 10,200 ft. and completed through Vicksburg perforations at 9,533-51 ft. for a flow of 82 bbl. per day.

WEST TEXAS

Ellenburger Confirmation Prospect in Emma Pool

Superior Oil Co. 1-36-A University, northeast offset to the Ellenburger discovery in Emma pool in Andrews County, had drilled over 100 ft. of pay section in that formation, and had made one heavy flow on drill-stem test.

Top of the Ellenburger was 12,232 ft., minus 9,071 ft. Oil was recovered on drill-stem test between 12,229-12,246 ft. On test between 12,291-12,346 ft., oil reached the surface in 44 minutes. Flowing through ½-in. top choke, the well tanked 138 bbl. of 48° oil in 1 hour. Operators were coring ahead at last report. The well also developed oil on test of the Simpson sand at 12,155-12,196 ft.

Anderson-Prichard Oil Corp. 8 Cowden opened Ellenburger production in this Permian producing area, and had top of Ellenburger at 12,296 ft., minus 10,121 ft., and top of pay as 12,307 ft.

West Texas Cambrian . . . Humble Oil & Refining Co. 5 Olive May Keeney in Section 453 has added Cambrian sand production to Bronte field of Coke County, located 2 miles southwest of Bronte townsite.

An 18-hour flow test of 414 bbl. of oil through ¼-in. choke gaged the well a calculated daily potential of 552 bbl. of 52° oil. Pay section was open hole between 5,334-46 ft., total depth.

This well is the second Cambrian producer for Coke County. Other tests had promises of production but were not completed in that formation. Humble 3 Butner, Rawlings field opener to the north, was a Cambrian well, with pay at 5,541-53 ft.

New wildcat locations with Cambrian pay as the main objective included John J. Eisner 1 George Humlong Estate, Section 383, Emil Hanke Survey. Location is 4 miles south of Bronte.

Humble has amended location for its 19 Hickman, Cambrian wildcat 2 miles south of Bronte. Corrected location is in Section 5, O&MRR Survey.

Upton County . . . A second well has been completed in Amacker-Tippett Ellenburger field, being a ½-mile west extension to the discovery. The new producer is Hunt Oil Co. 2-106 Velma Tippett Amacker, which produced 527 bbl. of oil a day through 8/64-in. choke from perforations at 12,100-12,200 ft.

McKee production in Lea field . . . Gulf Oil Corp. 3-E Lea has been completed as a McKee sand producer, adding the third pay to the field. Completion was on the pump for 44.8 bbl. of oil a day from perforations at 7,490-7,520 ft. This well was previously completed from Ellenburger pay at 8,090-8,170 ft.

TEXAS GULF COAST

New Gas-Condensate Production Opened

Superior Oil Co. has opened new gas-condensate production in Karnes County.

The 1 Mixon gaged 2,418 M.c.f. of gas per day plus 37.4 bbl. of condensate per day on 15/64-in. tubing choke from perforations at 6,549-55 ft. Gravity is 53.5°. The discovery is 4½ miles south of Runge. Superior's 2

Mixon is drilling as the west offset to the discovery well.

New Pay in Harris

Jack W. Frazier has run official potential at 2 The Minnetex Co. "A," opening a new oil pay on the west side of old Mykawa field in Harris County.

The well is final from 14 perforations at 4,830-37 ft. and flowed 213 bbl. of 26.8°-gravity oil per day. It is located 1 mile southeast of Mykawa townsite in the William Lovett Survey, A-526.

High Gas-Oil Ratio Oil Well Finaled

The Texas Co. completed 6-A R. K. Wilson in Chocolate Bayou field in Brazoria County. The well is a high gas-oil ratio producer.

The well was completed producing 178 bbl. of 58°-gravity oil per day on 20/64-in. choke from perforations at 10,133-137 ft. Gas-oil ratio was set at 27,100:1. Well is in the A. G. Reynolds Survey, A-121, 5 miles southeast of Liverpool.

Aldine Area Well Completed Dually

Eddy Refining Co. has run official potential at 1 Phoenix Dairy Unit on the southwest side of Aldine area in Harris County.

The well was completed in the Morgan sand of the Yegua from 7,300-08 ft. and from the Corzelius sand of the Yegua from 7,528-34 ft. From the upper zone the well flowed 1,200 M.c.f. of gas per day and 19.5 bbl. of 56°-gravity distillate per day on 10/64-in. choke. The lower zone flowed at the rate of 1,500 M.c.f. of gas per day and 21.7 bbl. of distillate daily on an adjustable choke with an open flow of 8,000 M.c.f. per day.

NORTH TEXAS

Fourth Cambrian Well Finished in North Dora

Skelly Oil Co. has completed another Cambrian well in North Dora field, with the highest flowing potential for that field. The firm's 5-B Boyd made a 2- hour flow of 194.5 bbl. of oil through ¾-in. choke, and was rated at 2,335 bbl. daily.

Top of the Cambrian pay was 6,090 ft. on elevation of 2,496 ft., and pay section was perforated between 6,090-6,154 ft. Completion was natural.

Grayson County developments . . . L. O. McMillan 1 Mary Feidt, 3 miles northeast of Sadler, has confirmed gas-distillate production discovered by Hibbert 1 Short. No. 1 Feidt was running casing at last report, following a gas and liquid flow on drill-stem test from 7,840-80 ft. Top of the Oil Creek sand was 7,808 ft.

H. F. Gibson 1-A McCoy, 3½ miles northwest of Sadler, has been completed from Oil Creek sand pay between 7,592-98 ft. Initial potential was 254 bbl. of oil a day through ¼-in. choke.

New exploration work in the county included a 7,000-ft. test by Kay Kimbell to be drilled 2 miles southwest of Whitesboro, and 1 mile northwest of present production. The project will be 1 W. J. Goodwin, M. Thornburg Survey, A-126.

Jake L. Hamon 1 J. G. Huff is to be a 5,800-ft. wildcat, 5 miles southwest of Southmayd, and southeast of the Huff pool. Location is in the C. H. Harwood Survey.

Sherman County . . . A. W. and Blair Cherry 1 Arthur Ross, wildcat 9 miles north of Stratford, developed 75 ft. of gas-cut mud on drill-stem test at 3,158-3,211 ft. The section was not identified, other than being in the Permian. Projected depth is 6,000 ft.

Humble Oil & Refining Co. 1 Brown, 6 miles northwest of Stratford, was drilling ahead below 3,135 ft.

INDIANA

In Pike County Milton and Hal Lobree are preparing to test the first Cypress oil saturation within a 3-mile radius at 1 Grubbs-Willis-Ennis, 18-1s-8w, 6 miles southwest of Petersburg.

Yale Stokes and Chuck Bennett have the first potential pool discovery in 2 years at a Vanderburgh County wildcat indicated.

Sun Oil Co. is drilling the first Salem test 4 miles east of Griffin at 1 Reynolds, NW SE SW 3-4s-13w, Posey County.

ILLINOIS

John Steele & Associates have set casing on the first Paint Creek sand saturation in Saline County at 1 Jones, NE NE SW 20-8s-7e, 1½ miles south of prolific Eldorado pool. A 24-hour drill-stem test on 16 ft. of saturation gassed in 45 minutes, recovering 100 ft. of clean oil, 55 ft. slightly mud-cut oil, no water.

WHEATLEY'S

3½" x 5" PISTON PUMP

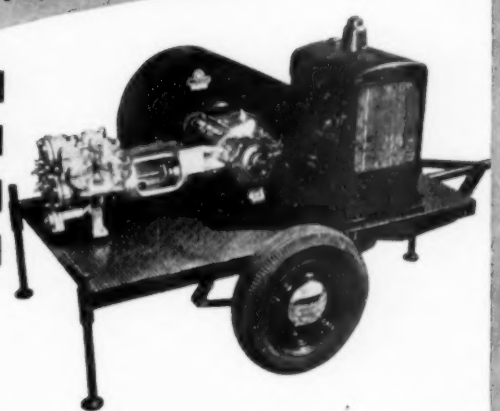
SAVES $1,000.00*

SALT WATER DISPOSAL

WATER FLOODING

CRUDE GATHERING

ALL-PURPOSE UTILITY



BRONZE • IRON • STEEL FLUID ENDS

FIG. 535
SKID OR TRAILER MOUNTED

SPECIFICATIONS

Piston	Stroke	BPH	PSI	HP	Wt. Lbs.
2"	5	35	900	15	700
2½"	5	56	520	15	700
3"	5	83	350	15	700
3½"	5	115	255	15	700

Plunger Load: 2500#

- HERRINGBONE GEARS
- REDUCING LINERS
- POT TYPE FLUID END
- NO ROD OVERLAP
- ANTI-FRICTION BEARINGS
- CONTROLLED LUBRICATION

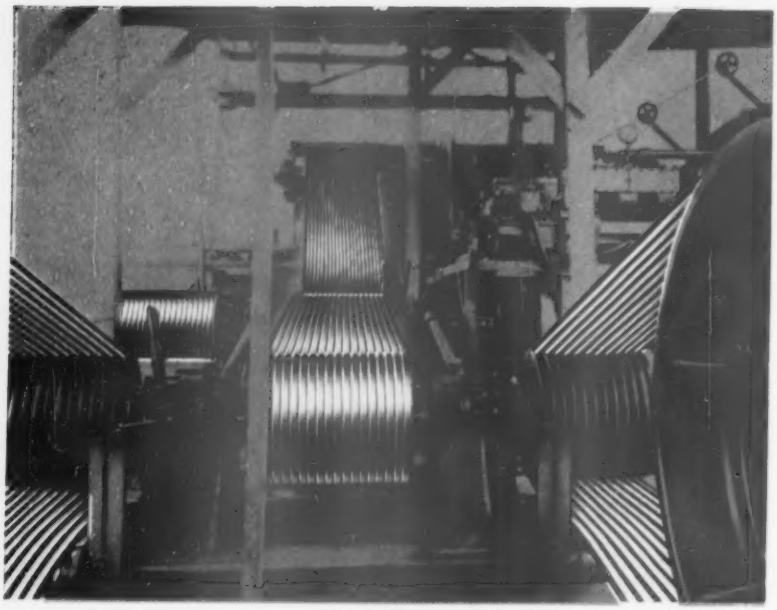
* TOTAL UNIT SELLS FOR $1,000 UNDER CONVENTIONAL 4" x 6" FIELD PUMP AND ANSWERS MOST PURPOSES

OVER 1,200 UNITS NOW IN USE!

WHEATLEY PUMPING UNITS AVAILABLE THROUGH:

Charles Wheatley Cos. • Franklin Supply Co. • J & L Supply Co.
United Supply Mfg. Co. • Walker-Neer Co. • D. T. O'Conner Co.
Wheatley Equipment & Supply, Limited

WHEATLEY
PUMPS & VALVES
TULSA • OKLAHOMA



DEVELOP ALL THE POWER

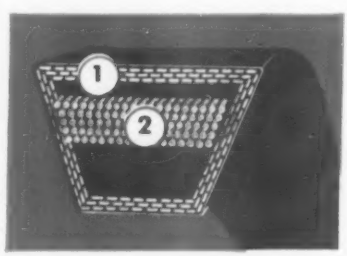
with "*All-Weather*" Thorobred V-Belts

Come rain or shine, hot weather or cold, Thorobred V-Belts can take it. That's why they're preferred for outdoor installations such as this.

And there's a reason — three, in fact. First, there's the "weather-proof" cover, designed to provide maximum protection to the inner structure. It consists of tough, bias-cut "Hy-Twist" fabric impregnated with special rubber compound. Inside is the load-carrying section consisting of rubber-coated cords which provide high tensile strength, great flexibility and high resistance to fatigue. Special blends of natural and synthetic rubbers eliminate distortion and heat build-up and maintain rigidity.

Get these rugged, pulley-gripping V-Belts from conveniently located Dayton distributor warehouse stocks. Dayton's Field Engineering service is available, too, on a 'round-the-clock basis to help you with your power transmission problems.

For detailed information, write direct to Dayton Rubber Co., Industrial Division, Dept. 705, Dayton 1, Ohio.



1. All Weather "Hy-Twist" fabric.
2. Continuous filament, high twist rayon cord.

For every oil field V-Belt need

Dayton Rubber

Since 1905 © D. R. 1954

World's Largest Manufacturer of V-Belts

Dayton Rubber Co., Industrial Division, Dayton 1, Ohio

OKLAHOMA

Mississippi Shows Reported at Woods Test

Gulf Oil Corp. 1 Zimmerman, Woods County wildcat in SE NW NW 12-28n-18w, reportedly has shows in the Mississippian for a prospective new discovery in the Yellowstone pool area (arrowed on map).

The indicated strike is 4½ miles southwest of Yellowstone pool, where Arbuckle production is found. The Yellowstone pool

discovery well also has shows in the Mississippian. A core taken at the 1 Zimmerman from 5,572-5,622 ft. recovered 50 ft. of lime with 40 ft. 6 in. bleeding oil and 3 to 6 per cent porosity. A drill-stem test is being taken at 5,529-5,622 ft. Gas flowed in 5 minutes at the estimated rate of 240 M.c.f. per day.

Yellowstone pool was 1953's most significant discovery in Oklahoma. Champlin Refining Co. 1 Diamond, Yellowstone pool opened, was completed for initial production of 25½ bbl. of 43°-gravity oil in 24 hours from the Arbuckle at 6,134-40 and 6,149-52 ft. The pool opened first oil production in Woods County and in this section of Oklahoma.

More Pay Tested at Grady County Wildcat

Phillips Petroleum Co. has proved on drill-stem test another pay section at their Grady County stepout well, the 1 Steve, C SE NE 35-5n-5w.

Recovery of 940 ft. of free oil and 180 ft. of muddy water was reported on a formation test at 12,753-816 ft. A drill-stem test previously at 12,600-727 ft. recovered 728 ft. of oil and 394 ft. of oily mud.

The stepout test is ½ mile northeast of Bradley pool's discovery well. It was completed at plugged back depth of 9,507 ft. The 1 Steve opens a new deeper pay. The well is projected to a depth of 14,000 ft.

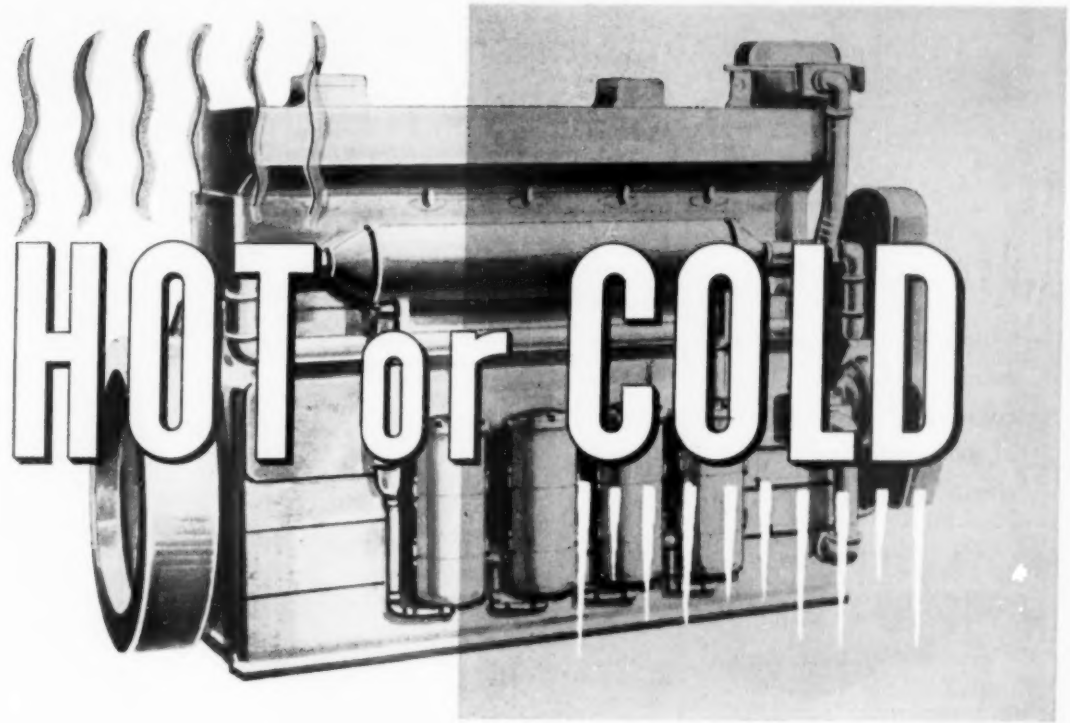
British-American Oil Producing Co. is completing 2 Burkes, C NW SE 12-4n-5w, in Southeast Bradley pool to the south. The Springer well flowed 345 bbl. of oil in 24 hours from open hole on 16/64-in. choke.

Osage County

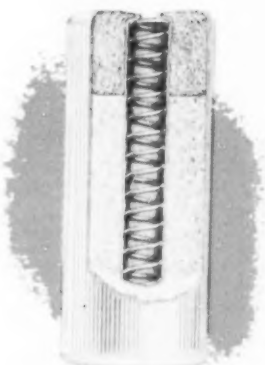
The "Little Chief" in Osage County is in the news again.

This time its a southeastern extension wildcat well oil discovery reported by Sunray Oil Corp. as a ¼-mile step-out to the company's Northeast Little Chief field discovered in 1952.

The new well, SW 7-25-7, has been brought



PROTECTED AT ALL TIMES



CP* Controlled Pressure elements are the subject of an interesting and helpful booklet, that can save you money. Write for your copy today — it's free, of course.

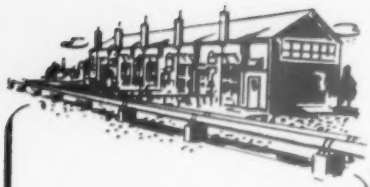
You know that engines are completely protected only if the lube oil is filtered under *all* conditions. It is essential that dangerous particles be removed when the oil is cold and viscous, just as it is under normal operating temperatures. When you have less than full-flow filtration, you may not be protecting critical surfaces, if a part fails or if oil is contaminated at the start, because the oil is by-passed around the filter element.

In a Winslow CP* element, cold oil *immediately* flows through the coarser section of filter material, which accepts the oil and removes all critical particles. As the temperature rises, more of the oil flows through the dense section of the element, assuring complete filtration at all times. The proportion of coarse and dense filtering media has been determined by laboratory research and field testing for each size of filter, and is an exclusive design feature of Winslow CP elements.

Winslow filters are your assurance of longer oil life and maximum engine protection under all operating conditions.

WINSLOW FILTERS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California



proficiency . .

• in construction is the product of skill, knowledge, and the experience of men dedicated to their work.

STATION CONSTRUCTION CO.

General Contractors

J. B. Latham, President.

2518 DREXEL DR., HOUSTON, TEXAS

CRUDE OIL ● OIL PRODUCTS
GAS AND WATER PUMP STATIONS
TANK FARM SYSTEMS ● TERMINALS

JET-LUBE

VL-5

VALVE LUBRICANT

MICRO-GROUND

JET-LUBE VL-5 is a low friction, valve lubricant with micro-ground moly-disulphide. Ends "sticking" valve problems. High temperature. No melting point. Insoluble in hydro-carbon solvents, water, brine, sulphur, acids and alkalies. Batch controlled. Fully guaranteed.

Order through your supply store or send for complete details

JET-LUBE INC.

7362 W. BEVERLY BLVD., LOS ANGELES 36

in at 2,824-ft. depth to flow at a rate of 460 bbl. of oil per day through 20/64-in. choke, with 340 psi. tubing pressure.

The company's production geologists believe that the new well indicates a connection between the company's Northeast Little Chief field and the East Little Chief field of Osage County, and will drill additional wells on its ¾-section tract for further testing.

Sunray discovered Northeast Little Chief field in mid-1952 in an area where many skeptics had said "all the oil here has already been found." Since that time, Sunray has completed 35 net oil wells in the field. Production during 1953 from these leases exceeded 250,000 net bbl. of crude oil for Sunray. The wells are producing from the Burbank sand with a low permeability which responds favorably to sandfrac and stratafrac treatment for long-time production.

Cabot Carbon Co. has completed 1 State-Williams Unit, 1-mile extension and confirmation to lower Purdy sand oil production in western Texas County's Keyes Gas District east extension area. (B on map). The well flowed and pumped 210 bbl. of of 39.5°-gravity oil per day from lower Purdy perforations at 4,271-77 ft. Cities Service Oil Co. 1 Turner "A," (A on map), is the oil discovery for the area, completed in 1953 for 205 bbl. of oil per day plus 1,201 M.c.f. of gas per day. In southeastern Texas County United Producing Co. 1 Sillars, wildcat 2½ miles northeast of Southeast Camrick field (C on map), is testing Morrow sand perforations. A drill-stem test in the Morrow sand flowed 1,050 M.c.f. of gas per day.

Areal Extent of Lincoln County Pool Being Proved

Davidor & Davidor 1 James J. Phipps, NW NW SW 21-15n-3e, ⅞ of a mile west of the discovery well of North Sweet Home pool in Lincoln County, is one of two stepouts that should prove the areal extent of the new Skinner producing area.

One mile to the southeast the 1 Wakley, SE SE NE 27, is setting surface casing. The 1 Phipps, NW NW SW 22, east offset to the discovery well, is at total depth of 4,470 ft. in Red Fork sand. The discovery well of the new pool, the 1 Wakley, NE NE SE 21, flowed 198 bbl. of oil per day through 12/64-in. choke.

The Texas Co. 1 Wakely, SE SE NE 21, is the confirmation well in the pool. The company is completing the well flowing at the rate of 28 bbl. of oil per hour through 16/64-in. choke. The Senora sand flowed 145 bbl. of load and 304 bbl. of new oil in 24 hours through 16/64-in. choke following fracturing.

Prairiedale Pool Expands Rapidly

Drilling activity in Stephens County's Prairiedale pool is on the increase, stimulated by recoveries which are estimated to run to 500 bbl. per acre-foot.

Samedan Oil Corp. 1 Burkhart, NE NW NE 34-1n-5w, made 144 bbl. of 32°-gravity oil on the pump from perforations at 5,1⁰6-95 ft. The 2 Burkhart, NW NW NE 34, west offset, is testing. The 1 Ford on the north edge of the field in SW NE SE 27 is putting on pumping equipment. The 2 Little in SW SW SE 27 is below 5,396 ft.

T. T. Eason & Co. 1 McLendon, NW NE SW 35, a south stepout, is shut in for tankage. The Easton 1 Drake, NE SE NE 34, flowed 15-25 bbl. of oil hourly. Stanolind Oil & Gas Co. 2-A Burkhart, NW SE SE 27, is nearing completion, and the 1-B Burkhart, NW NE NE 34, is a new location. An-Son and Samedan drilling simultaneously on leases due for early expiration uncovered the Hoxbar reservoir. Anson 1 Baker, NE NW NW 35, is producing 146 bbl. per day on pump gage. Samedan 1 Burkhart, NE SW SE 27, pumped 103 bbl. of oil daily.

CALIFORNIA

New Field in Prospect For McKittrick Area

In westside San Joaquin Valley, 9 miles northwest of McKittrick, Union Oil Co. was attempting to complete a wildcat as a new oil field discovery. At the first of last week the test, 25A-7 Hancock in NW SW 7-30s-21e, was being swabbed after 5½-in. liner had been set at 1,878 ft. Completion was being attempted in the interval 1,840-78 ft., the latter being the depth to which hole was plugged back from 2,852 ft.

The prospective new field opener is about 4 miles northwest of Northwest Belgian Anticline, nearest oil production. This field was discovered in March of last year and now has seven wells producing from the Phacoides

FOR SALE IN LAKE SUPERIOR

Au Train Island

A scenic recreation spot, ideal for development by a private individual, corporation or institution

On the South Shore of Lake Superior in one of the most beautiful parts of Michigan's upper peninsula, 106-acre Au Train Island, with 56 adjacent acres on the mainland, offers privacy, a unique setting and accessibility. Believed to be the only remaining privately held island in Lake Superior, the property is conveniently situated only about 10 miles from the city of Munising. It is served by air lines at Munising's Hanley Field and Grand Marais International Airport. The proposed Mackinac Bridge and Highway will cut driving time to Chicago and Detroit to five hours.

Excellent fishing, boating and winter sports . . . game in abundance. Less than a mile offshore, the island is at present undeveloped, a perfect site for a commercial resort, or the camp of a corporation, institution or individual. Owner offers attractive price and liberal financing. Ask your local broker or Previews for illus. brochure OG-75045.

PREVIEWS INC.

The Nationwide Marketing Service

231 S. LaSALLE ST., CHICAGO 4 • AN 3-7189
49 E. 53RD ST., NEW YORK 22 • PLAZA 8-2630

BOSTON • DENVER • PALM BEACH • PARIS
PHILADELPHIA • LOS ANGELES • SAN FRANCISCO

sand (lower Miocene) at approximately 3,500 ft.

Oxnard Discovery Offset

Standard Oil Co. of California was preparing to get under way with a southwest offset to the deep oil discovery Lloyd Corp., Ltd., recently completed at Oxnard field, Ventura County. Site of 2 McInnes is in SE SW 31-2n-21w, approximately ¾ mile northeast of Sespe pool Standard 1 McInnes discovered last July.

North of the recent 10,000-ft. discovery, which likewise is reportedly in the Sespe, Lloyd 1 Borchard was nearing the 5,000-ft. mark. It, like the discovery, is a joint operation with Standard.

Somis Tests Nears Completion

Outcome of two wildcats in the Somis area of Ventura County which have been under way for the past 5 months should soon be known. In 5-2n-20w, about 3½ miles south of South Mountain production, Sunray Oil Corp., Oper. 1 Fasshauer had plugged back to 8,868 ft. after being bottomed at 10,060 ft. A string of 7-in. casing already had been set at 7,780 ft. so that a liner was being run to bottom.

In Section 18, Continental Oil Co. et al 1 Berlywood likewise had been plugged back for further testing of shows encountered in drilling. Bottomed at 9,206 ft., hole had been plugged back to 7,575 ft. with 7-in. casing set at 7,150 ft. In Section 21 a more recently started test, The Texas Co. 1 Miketta, had reached a depth of 5,900 ft.

Humble Starting Gas Search

Humble Oil & Refining Co. reportedly was starting an extensive core-drilling campaign in Sacramento Valley in an attempt to locate potential gas-bearing structures. More than 20 coreholes are to be drilled in the valley district, with average depth of the holes being about 2,500 ft.

ROCKY MOUNTAIN

MONTANA

New Northeastern Montana Drilling Scheduled

H. L. Hunt has taken farmout of Daniels County acreage from Stanolind Oil & Gas Co. and is rigging up for a wildcat in the Silver Star area. The well is 1 State, C NW SW 26-34n-47e. The area had intermittent drilling over the past 2 years. Previous wildcats in this county have had shows in Madison or Devonian or both, but have found the formations too hard and tight to produce.

Golden Dome Discovery Indicated

Cities Service Oil Co. recovered distillate and some distillate-cut mud on drill-stem test of a wildcat in the Golden Dome area of Carbon County opening the possibility of a second discovery in the general area.

Test of the interval 5,200-43 ft. at 1 Kelly, C SW SW 12-7s-22e, recovered 40 ft. of 61.8°-gravity oil and 60 ft. of mud-cut oil with distillate in 30 minutes. Flowing pressure was 700-800 psi. Test was in the Greybull sand, with the section reported as only about 4 ft. in thickness.

The well is the first indication of success in the area since Kirk Oil Co. completed 1 Stow, NW NW SE 14-7s-22e for a flow of 16 bbl. of oil per day through choke, also from Greybull sand. The 1 Kelly is reported running some 400 ft. higher structurally than the Kirk Oil discovery, and the operator will drill ahead to test Prior.

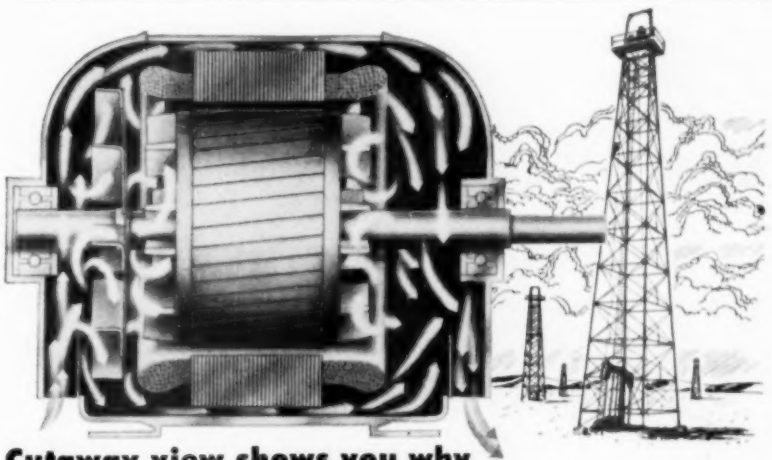
West Side Wildcats Staked

Union Oil Co. and Carter Oil Co. have made location for a wildcat in the Landslide Buttes area of Glacier County to test Madison at about 5,800 ft. The well is 1 Tribal-544, Lot 1, 19-37n-8w. It is 8 miles west of Reagan field, where there is production from Madison and about 7 miles southeast of Del Bonito field. Carter Oil paid a bonus of $26.89 per acre for the land at Indian lease sale in 1953.

Amerada Petroleum Corp. has made location for a 4,500-ft. test of basal Amsden at 2 H & H Ranch, C SW SW 8-10n-29e, in the Melstone area of Musselshell County. It is 3½ miles northwest of Melstone production.

Third Cabin Creek Producer Completed

Shell Oil Co. completed 34-33 NP Unit, NW SW SE 33-10n-58e in Cabin Creek field, Fallon County for a flow of 226 bbl. of oil per day through 12/64-in. choke from Ordovician. It is the second well in the field to be completed in this formation. The discovery made a calculated potential of 4,253 bbl. per day from both Ordovician and Silurian,



Cutaway view shows you why

R&M Oil Country Motors run COOL!

"Clean-sweep" ventilation insures longer motor life

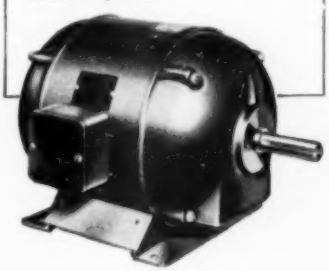
There's an R&M "All-Weather" motor that's built for YOUR job!

Triple-Rated—for changing power needs. Slight additional cost is quickly written off by power savings. You buy power only for the connected horsepower you need. As requirements change, you change the horsepower—*without changing motors.*

High Slip—ideal for the reciprocating load requirements of oil pumping.

High Torque—to meet heavy starting problems.

Standard Integrals—from 1 to 125 horsepower.



...and greater stamina for overloads

Cool running—hour after hour at full capacity—is one of the big reasons why so many oil field men swear by R & M "All-Weather" Motors. These motors are designed to permit ample circulation of high velocity air—to carry off motor heat, as well as heat developed by exposure to the hot sun. And, openings are drip-proof, rain-proof; screened to keep rodents out. Special treatment inside and out resists rust and corrosion. Heavy duty bearings are sealed to retain lubricant. In short, here are motors that will give you years of faithful service.

It will pay you to get the whole story!

Write today for name of your nearest R & M distributor. He can prove—in dollars and cents—that all these "extras" in R & M motors are furnished *at a standard motor price!* Be sure to ask for R & M bulletin on oil field motors; it's packed with good, usable information.

R&M *"All-Weather"* *Oil Country* MOTORS

ROBBINS & MYERS, INC.
Springfield 103, Ohio • Brantford, Ontario
"All-Weather" is the trademark of Robbins & Myers, Inc.

TO COMBAT LOST CIRCULATION

Fibrous material blended with flat, spongy flakes . . . shown actual size.

HUNDREDS NOW GETTING
TOP RESULTS
AT LOW COST

Success-in-use, plus economy, has made Silvacel one of the industry's most widely used materials to combat lost circulation. Silvacel is a scientifically designed blend of specially prepared fibrous materials of controlled length, combined with flat, spongy flakes. This blend provides a wide range of particle sizes and shapes ideally suited for complete sealing of the most difficult fractured and vulgar formations. Bridging is quick . . . forming a tough, fibrous mat which becomes imbedded with mud to speedily form a tight seal.

CHECK THESE FEATURES:

- Does the job quickly, *at low cost.*
- Comes in easy-to-handle, loosely packed 40-lb. bags.
- Pourable; mixes readily with mud—is easily "wet" by mud.
- Does not break down through circulation.
- Will not rot, deteriorate or sour in storage or in the hole.
- Is readily pumped through ordinary rotary drilling equipment and does not "rope" or "ball up."

SILVACEL available through most supply companies.
Write us for more information.

WEYERHAEUSER TIMBER COMPANY
SPECIAL PRODUCTS DIVISION • TACOMA 1, WASHINGTON

and the second well in the field was completed in Silurian. Oil has been recovered from both formations in all Cabin Creek drilling to date.

Richland County Wildcats Still Testing

Sun Oil Co. and others are testing new perforations at 1 Beagle Land & Livestock, NE SW SW 17-23n-59e in the North Sidney area of Richland County. From the zone 9,095-9,138 ft. the operators swabbed 63 bbl. of oil in 13 hours after acid. This is the second Madison zone to be tested in this well, which has indicated the first possibly commercial production from this formation in the area east of the Cedar Creek anticline in Montana.

North of this well Sun Oil and Phillips Petroleum Co. are swabbing from Madison at the second well in the Brorson area. The well, 2 Dynneson, C SW SW 29-24n-58e, made 24 bbl. of oil and 16 bbl. of load water in 12 hours. Tests of the zone 9,410-70 ft. are continuing.

COLORADO

New Morgan County Discovery Apparent

Ray Campbell and Colorado-Wyoming Oil Co. recovered gas at a rate in excess of 10,000 M.c.f. per day on test of "D" sand at 1 Ross,

New Drilling Co. reported a flow of oil at the rate of 5 bbl. hourly on test of the D sand and 1 Voss (O on map), SW SW SW 6-13n-53w, Kimball County, in the Denver-Julesburg basin area of Nebraska. The wildcat is about 2½ miles west of Southwest Potter field. There has been no previous drilling in the immediate area. Ray Campbell and Colorado-Wyoming Drilling Co. are running pipe at 1 Ross, C NW NW 23-3n-59w, Morgan County discovery (C on map). Operators gaged gas at a rate of more than 10,000 M.c.f. per day. The discovery is about 6½ miles west of Adena field production, and there has been very little drilling in the general area. Eddie Fisher has recovered oil on drill-stem tests of two wells in the South Adena area of Morgan County (D on map). They offset the recent strike at 1 State, NE NE SW 35-1n-58w, which is now reported flowing at the rate of 12 bbl. of oil per hour. They are perforating at 2 State, SW NE SW 35-1n-58w. Ohio Oil Co. has completed 1 Rohlfing (B on map), NE SW NW 11-12n-52w, Cheyenne County, Nebraska, for a pump gage of 117 bbl. of oil daily. The strike is about 4 miles north of production in West Peetz field in Logan County, Colorado. It is within the trend southwest of Sidney.

C NW NW 23-3n-59w, Morgan County. The apparent discovery is northwest of Adena field. Test was run of the zone 5,906-28 ft. and the 10,000 M.c.f. flow was reached during the 30-minute open time. The well was shut in with the blow still increasing. Casing has been run.

WYOMING

Big Horn County Discovery Completed

Sohio Petroleum Co. has completed 1 Standard-Wambeke, C SW NW 31-57n-97w for a pump gage of 61 bbl. of 22°-gravity oil per day. The well is in the Deaver area. Production is from Tensleep at 5,230-42 ft. The new pool is about 2 miles north of North Byron.

Walker Dome Confirmation Successful

Ohio Oil Co. reported a pump gage of 141 bbl. of oil per day at 2 Smith, NW SW NW 9-46n-99w in the Walker Dome area of Hot Springs County. The well is a confirmation to the discovery in this area made last year by Forest Oil Co. Production is from Phosphoria. The top of this formation was found by Ohio at 6,519 ft.

Hansen Ridge Wildcat Finds Tensleep Wet

Sinclair Oil & Gas Co. recovered 6,440 ft. of brackish water with no shows on drill-stem test 10,486-10,510 ft. at 1 Unit, SE SE NW 30-19n-89w in the Hansen Ridge Unit, Carbon County. Cores of this upper Tensleep zone showed light staining and had good odor. The operator is reported running logs at the well, about 12 miles southwest of production at Hatfield.

WESTERN NEBRASKA

New Kimball County Pool Is Opened

New Drilling Co., Denver, reported a flow of oil at the rate of 5 bbl. per hour on drill-stem test of "D" sand at 1 Voss, SW SW SW 6-13n-53w, Kimball County. Test was of the zone 5,712-19 ft. and tool was open for 30 minutes. There was oil at the surface after 25 minutes. Flowing pressure was 500-1,050 psi. No shows were reported in "J" sand and the casing has been run for completion in "D" sand. The wildcat is about 2½ miles west of production in Southwest Potter field.

Cheyenne County Discovery Finaled

Ohio Oil Co. has completed 1 Rohlfing, NE SW NW 11-12n-52w, Cheyenne County for a pump gage of 117 bbl. of oil per day. Production is from the "D" sand, topped at 5,047 ft. The well is within the general producing trend southwest of Sidney, but is further south and east than previous production. It is about 4 miles north of production in West Peetz field, Logan County, Colorado.

Rank Wildcat Series Started

F. M. McHale, Indianapolis independent has started a series of three wildcats in Grant,

For Trouble-Free Pipe Threading ...its a 65R

RIDGID

This 65R threads 1" to 2" pipe with 1 set of dies ...and it won't jam!

You won't find a die stock to equal this popular 65R—anywhere! It saves time—one set of self-contained high-speed dies adjust to 1", 1¼", 1½" or 2" pipe or conduit in 10 seconds! Mistake-proof self-centering workholder sets to size instantly! It saves trouble—lead screw won't jam, it kicks out automatically when standard length thread is cut. Clean perfect threads, *fast!* For trouble-free extra-easy pipe threading buy 65R at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

Hooker and Cherry counties, on acreage farmed out by Quintana Petroleum Co. McHale is drilling below surface at 1 Monohan Ranch, SE SE SE 11-25n-36w, Cherry County. He is preparing to spud 2 Monohan Ranch, NW NW NW 12-24n-34w, Grant County, and has location for 3 Monohan Ranch, NE NE NE 21-24n-34w, Hooker County.

NORTH DAKOTA

New Drilling Scheduled For Eastern Williston

Two new locations in Rolette County have been staked with exploration on the eastern side of the Williston basin still an important factor in regional planning. S. D. Johnson staked 1 Bryant estate, SW NW 31-164n-70w, the second in a series being drilled on farmouts from Union Oil Co. of California. The new location is to test Lodgepole. It is about 7 miles northwest of the first in the series by Johnson.

Ward-Williston Drilling Co. of Bismarck has location for 1 State, SE SW 11-161n-72w, and will test the Jefferson member of Devonian at about 3,400 ft.

Two Important North Dakota Wildcats Abandoned

Western Natural Gas Co. has abandoned 1 Truax-Traer, NW SW 13-132n-102w in Bowman County, at total depth of 10,630 ft. The well was drilled as a tight hole and no tops or other data have been released.

In Hettinger County, Socony-Vacuum Oil Co. has abandoned F-12-24 Jacobs, SW SW 24-134n-96w. At total depth of 10,433 ft. the well was reported in Ordovician. Slight oil and gas shows were recovered on drill-stem test of this formation.

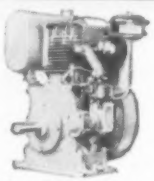
WISCONSIN-POWERED C-R-C "SP" DOPE KETTLE *Solves* Difficult Power Problem

Power TO FIT THE JOB — Power TO FIT THE MACHINE

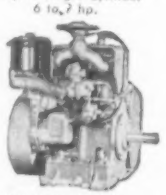
Towed directly behind a Traveling Pipe Coater, this Dope Kettle, made by Crutcher-Rolfs-Cummings, Inc., transfers liquid tar to the coating machine by means of a rotary pump. A Model VF4D Wisconsin 4-cylinder Heavy-Duty Power Unit provides dependable power for operating the tar pump, two fuel pumps, and two blowers for feeding air and fuel to the burners.

Dust and fumes that would ordinarily settle in radiator fins of a water-cooled engine, creating an insulation that causes engine to heat, do not affect the highly efficient, dependable AIR-COOLING System of the Wisconsin Engine because the powerful air blast keeps the dust moving. Just another point in favor of Wisconsin Heavy-Duty Air-Cooled Engines for oil field service.

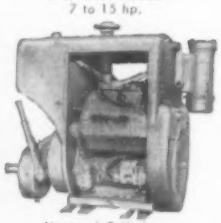
The Wisconsin line includes 4-cycle single cylinder, 2- and 4-cylinder models in a complete range from 3 to 36 hp. All models can be equipped to operate on kerosene, natural gas, butane or propane, utilizing the most readily available and economical fuels.



4-Cycle Single Cylinder 6 to 7 hp.



2-Cylinder Models 7 to 15 hp.



V-type 4-Cylinder 15 to 36 hp.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 S. MAIN STREET, TULSA, OKLAHOMA
M & M BUILDING, HOUSTON, TEXAS
505 SOUTH MAIN ST., WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Atascosa County: Thomas Bros. and M. L. Wise 1 Flores, W. Smith 949, A-642. Dry. TD 1,947 ft.

Brooks County: Monterey Exploration Co. 1 Cage, El Tule (Juan Jose Guerra) A-257. Dry. TD 6,801 ft.

Bexar County: E. A. Rogers 1 Friesenhahn, Fernando Rodriguez A-15. 10 BOPD, 18°, Austin chalk 1,107 ft. TD 1,129 ft. (Oil discovery).

Sec. Oil Co. 1 Mrs. M. Maspero Est., J. Montes A-11. Dry. TD 2,323 ft.

Dimmitt County: Howeth & Mason and Intex Oil Co. 2 Davenport, Jacob Schroeder 26, A-670. Dry. TD 4,507 ft.

Duval County: Bridwell Oil Co. 1 Nicolas C. Cadena, D. Barrera 26, A-54. Dry. TD 5,005 ft.

Jim Hogg County: George H. Coates A-8 Silver Lakes Ranches, Inc., E Sordo Gr. (Luis Vela) A-326. Dry. TD 4,500 ft.

Sam Cunningham and Geo. H. Coates 3 Rita Benavides, Noriecitos Grant. Dry. TD 3,520 ft.

McMullen County: J. W. Gorman 2 Hagist Ranch, G. B. Kinney 8, A-1164. IP 1,800 M.c.f. of gas per day, open flow, top pay 2,178 ft. TD 2,857 ft. (Gas discovery).

Nueces County: Kirkwood & Co. 1 Renken, Driscoll Ranch. Dry. TD 6,508 ft.

Plymouth Oil Co. 1-269 State of Texas, Aransas Bay. Dry. TD 9,856 ft.

Renwar Oil Corp. 1 Hoelscher, Geo. Wilmot 168. Dry. TD 7,518 ft.

Starr County: E. D. Block, Tr. 2 Luis F. Martinez, Blk. 20, T. R. Cunningham Subd., Porcion 71. Dry. TD 439 ft.

F. Wm. Carr 1 Guerra, Francisco Guerra A-330. Dry. TD 3,505 ft.

Clark Fuel Oil Co. 2 Canales, Tr. 2, Sh. 2, Parcel B, La Sacatosa. Dry. TD 1,685 ft.

Wymore Oil Co. 1 Rogan, El Javali. Dry. TD 2,513 ft.

Travis County: Mars Oil Co. 1 Nagle, L. Kimgro. Dry. TD 670 ft.

Val Verde County: S. F. Hurlbut et al 1 Bluff Creek Ranch, I&GN Sur., Sec. 3, Blk. 5. Dry. TD 3,482 ft.

Webb County: Robt. K. Franklin 1 White, Sur. 1106. Dry. TD 2,402 ft.

O. W. Killam 110 Bruni Est., Borrego Grant. Dry. TD 1,681 ft.

Willacy County: Heep Oil Corp. and Herman F. Heep 1 Garcia-Dougherty, San Juan de Carricitos. Dry. TD 10,015 ft.

Zapata County: Delhi Oil Corp. and Gust Tsesmelis 1 Gutierrez, Charco de la India. Dry. TD 4,560 ft.

TEXAS GULF COAST

Brazoria County: Reynolds Mining Corp. 1 Burrows et al, John Peske, A-113. IP 82 BOPD, 3/16-in., 33.7°, Vicksburg 9,538 ft. TD 10,200 ft. (Oil discovery of Lurey pool).

Goliad County: McKenzie Drilling Co. and Buford Goodwin 1 Ella Fimble, Wm. P. Smith A-252. Dry. TD 5,500 ft.

Hardin County: Ted Weiner and Arthur O. Wellman & Sons 2 Kirby Lumber Corp., B. H. Hawkins A-600. Dry. TD 7,021 ft.

Harris County: Jack W. Frazier 2 The Minnetex Co. "A," William Lovett A-526. IPF 213 BOPD, 12/64-in., 26.8°. Top pay

Technical-Engineering Textbooks

FOR YOUR WORKING LIBRARY

Here is your chance to make additions to your library of popular technical texts. These books are not published by The Oil and Gas Journal, but are offered to you through the Reader Service Department. Look the list over, pick out those that you want and send your order on the blank provided.

"OIL PROPERTY VALUATION"—Paul Paine
(John Wiley & Sons, Inc.) **$4.50**

Discusses oil properties and oil property interests. Covers unproved lands . . . oil and gas reserves . . . elements in valuation . . . valuation methods. Definitions and explanation make this book useful. 204 pages.

"PETROLEUM GEOLOGY"—E. N. Tiratsoo
(McGraw-Hill) **$7.50**

A world wide survey of oil lands—with facts on their structural and stratigraphic history. Covers all important principles of modern petroleum geology. 449 pages, 122 maps and diagrams, 8 plates, 2 folders. Technology of drilling fluids described.

"CHEMICAL ENGINEERS' HANDBOOK"—John H. Perry
(McGraw-Hill) **$17.00**

Details of developments in every branch of chemical engineering. Covers technical data, new procedures, modern applications, new equipment, etc. New 3rd Edition has over 2,000 illustrations, graphs, and tables. Thumb indexed. 1,942 pages.

"PETROLEUM REFINERY ENGINEERING"—W. L. Nelson
(McGraw-Hill) **$10.00**

Gives step-by-step presentation of refining methods—practical details on plant operations. Some of subjects covered are: catalytic cracking, solvent treating, sulfur compounds, ethylene manufacture, additive materials, reboiling, etc., etc. 840 pages, 179 tables, 268 illustrations. 3rd Edition.

"HOW OIL IS FOUND"—Ver Wiebe
(Private printing) **$8.50**

Suited to needs of oil operators, lease operators, drilling contractors, tax consultants. Includes seepages, oil rocks, structure, oil accumulation. Describes oil finding techniques fully. 247 pages, 312 illustrations.

"PRACTICAL OIL GEOLOGY"—Hager
(McGraw-Hill) **$8.00**

New 6th edition. A clear, concise, practical book covering the fundamentals of geology—methods for searching untested areas, selection of sites, application of geology in drilling. This edition carries a section of Veatch's Rule. 589 pages, 227 illustrations, 78 tables.

"STRUCTURAL GEOLOGY OF NORTH AMERICA"—
A. J. Eardley (Harper & Brothers) **$12.50**

Detailed description of the structural evolution of the North American continent. Double-column pages, 11¼" x 8¼", permit large drawings. Some 750 illustrations and 16 paleotecteonic maps in full colors. 620 pages.

"FIELD GEOLOGY"—Fredric H. Lahee (5th edition)
(McGraw-Hill) **$8.50**

A complete manual for petroleum and mining engineers and geologists. Presents methods and keys for recognition and interpretation of land forms and structures. Valuable new information on air photography and air photogrammetry . . . underground surveying . . . electronic location. 883 pages, 5" x 7", 630 illustrations.

"AMERICAN PIPE LINES"—George S. Wolbert, Jr.
(University of Oklahoma Press) **$3.50**

A thorough analysis of the complicated problem: ownership of pipe lines. Discusses historical, economic, factual development of pipe lines, including specific issues relating to industry rate and service requirements. Surveys existing legal and administrative remedies and decisions of the Interstate Commerce Commission.

"INTRODUCTION OF GEOPHYSICAL PROSPECTING"
Milton B. Dobrin (McGraw-Hill) **$8.00**

A practical treatment of the fundamentals, procedures, uses, and value of all the standard methods of geophysical prospecting. For each method discussed, the book covers basic physical principles, instrumentation, field techniques, reduction and interpretation of field data. 435 pages, 65 illustrations.

"FUNDAMENTALS OF RESERVOIR ENGINEERING"
John C. Calhoun, Jr. (University of Oklahoma Press) **$6.00**

A discussion of the application of engineering principles to various phases of reservoir engineering. Arranged in topical order are such subjects as Reservoir Fluids; Reservoir Rocks and Rock-Fluid Systems; Reservoir Principles—Gas Flow, Drainage and Water Influx; and Well Performance Applications. Collected from a series which appeared in The Oil and Gas Journal. 417 pages, 288 diagrams and graphs.

Title of Book	Price
	$
	$
	$
	$
Total of Order	$

Payment enclosed Purchase order enclosed Mail Invoice

(Make Checks payable to The Oil and Gas Journal)

Name .....

Address .....

City ..... Zone ..... State .....

Reader Service Department

THE OIL AND GAS JOURNAL

P. O. Box 1260 Tulsa 1, Okla.

WILDCAT COMPLETIONS

4,830 ft. TD 6,203 ft. (New pay at Mykawa).

Gulf Coast Leaseholds, Inc. 1 Flack et al, John Hagerland A-354. Dry. TD 9,036 ft.

Harrell Oil Co. et al 1 Penick, Rosaline Hardjurgen A-1192. Dry. TD 7,714 ft.

Jackson County: Salt Dome Production Co. 1 W. L. Hodges Est., Blk. 37, LaWard Farms. Dry. TD 8,518 ft.

Jasper County: American Republics Corp. and Houston Oil Co. of Texas 1 John D. Johnson fee, J. D. Johnson A-21. IPF 59 BOPD, 9/64-in., 32.7°, First Yegua 6,709 ft. TD 8,132 ft. (New pay at North Buna).

Liberty County: Dan J. Harrison, Jr. 4 Dan J. Harrison, Jr. "A" fee, H&TC No. 3, A-227. IPF 111 BOPD, ⅛-in., 25.6°,

"Electronics REDBOOK"

INDUSTRIAL USERS:

Write on your letterhead for your FREE copy

INTERSTATE
ELECTRONIC SUPPLY CORP.
230 IDA — P. O. BOX 2018
WICHITA, KANS.

Miocene 4,446 ft. TD 5,271 ft. (New pay at Hankamer).

Victoria County: Magnolia Petroleum Co. A-1 Keeran Ranch, Martin de Leon A-74. Dry. 8,668 ft.

Wharton County: Sam G. Harrison 1 F. E. Appling et ux., BBB&C 1 A-80. Dry. TD 6,150 ft.

EAST TEXAS

Anderson County: Loyce Phillips 1 Ballard, Wm. Gibson Sur., A-324, 2 miles east Neches. IPP 119.5 BOPD, 26°, sub-Clarksville 4,647-54 ft. TD 5,000 ft.

Signal Oil & Gas Co. et al 1 Carnes, W. T. Sadler Sur., A-867. Dry. TD 6,913 ft.

McLennan County: W. L. Cox and G. M. Odell 1 Harmon, James Stewart Sur., A-815. Dry. TD 855 ft.

Panola County: Hudson Oil & Gas Co. 1 Furrh, A. M. McLaughlin Sur. Shut in without potential gage, gas pay in Pettit at 6,064-94 ft. and Travis Peak 6,664-76 ft.

Titus County: John B. Stephens Jr. and A. O. Phillips 1 Woods, Titus CSL Sur., A-562. Dry. TD 4,814 ft.

Wood County: Jackson & Robbins 1 Dowell, A. Barcenas Sur., A-79. Dry. TD 5,574 ft.

TEXAS PANHANDLE

Gray County: Maguire 1 Franklin, 43-A6-H&GN. Dry. TD 7,560 ft.

Sherman County: Ada Oil Co. 1 Williams, 34-1T-T&NO. IP 3,600,000 cu. ft. gas, 3,651-75 ft. TD 3,735 ft.

Humble Oil & Refining Co. 1 Morris, 79-1T-T&NO. IP 21,500,000 cu. ft., Cisco 3,373-91, 3,381-3,426 ft. TD 6,100 ft.

WEST CENTRAL TEXAS

Callahan County: Midwest Oil Corp. 1 Rose, 6-8-SPRR. Dry. TD 4,040 ft.

Coleman County: Ab-Tex Drilling Co. 1 Lewellen, Sec. 102, ETRR Sur. Dry. TD 2,544 ft.

Woodson Production Co. 1 Morris Estate, 32-2-GH&H. Dry. TD 3,250 ft.

Fisher County: Texas Crude Oil Co. 1 Huddleston, 9-K-T&P. Dry. TD 6,162 ft.

Union Oil Co. of California 1 Williams, 34-3-H&TC. Dry. TD 7,218 ft. Elev. 2,065 ft., Ellenburger 6,970 ft.

Jones County: S. C. Herring Drilling Co. 1 Pittard, 11-1-T&NO. Dry. TD 3,187 ft.

Nolan County: Sorrells Oil Co. and S. J. Sackett 1 Wash, 180-64-H&TC. Dry. TD 6,220 ft. Elev. 2,242 ft., Ellenburger 5,776 ft., Cambrian 6,196 ft.

Lenoir M. Josey, Inc., 1 Wiman, 32-35-T&P. Dry. TD 7,100 ft.

Stephens County: P. W. Pitzer 1 Pitzer, 15-4-T&P. Dry. TD 2,082 ft.

Taylor County: Sid Katz and R. H. Venable 1 Fletcher, 8-1-LAL Sur. Dry. TD 5,214 ft.

Throckmorton County: Haynes B. Ownby Drilling Co. 1 Edsoll, I. J. Good Sur. Dry. TD 4,702 ft.

Ross & Roach 1 McKnight, Sec. 3,029, TE&L Sur. Dry. TD 4,233 ft.

NORTH TEXAS

Archer County: Hayden Farmer 1 Turbeville, Blk. 23, Jefferson CSL. Dry. TD 3,558 ft.

McMahon-Bullington Drilling Co. 1 Prideaux, William Henry Sur. Dry. TD 3,944 ft.

Moncrief & Wiley Oil Co. 2 Garvey, Sec. 1887, TE&L Sur. Dry. TD 1,075 ft.

Rock Island Refining Corp. 1 Rainey, Blk. 3, Denton CSL. Dry. TD 4,254 ft.

Denton County: Pat Irwin 1 O'Brien, P. Friend Sur., A-425. Dry. TD 1,870 ft.

Grayson County: Howell, Holloway & Howell 9-A Hutchinson, Samuel Stewart Sur., A-1069, 11 mi. NW Gordonville. IP 93 BOPD, 14/64-in., 38°, Strawn sand 2,590 ft. TD 3,290 ft.

Superior Oil Co. 2 Westbrook, M. B. Lamar Sur., A-704, 3½ mi. NE Whitesboro. IPP 84 BOPD, Strawn 6,497-6,504 ft. TD 6,892 ft.

Jack County: Anderson Drilling Co. 1 Parrish, N. B. Overby Sur., A-452, ½ mi. N Dearing field. IP 120 BOPD, 6/64-in., 42°, 3,003 ft. TD 3,012 ft.

E. B. Fulton 1 Pursley, C. C. Bloodworth Sur., A-2241. Dry. TD 740 ft.

QYG Oil Co. 1-B Stewart, TE&L Sur. 2782, A-790. IPP 8 BOPD, Cisco 326 ft. TD 338 ft.

Montague County: Moncrief & Wiley 2 Heaton, Oliver Buckman Sur., A-73. Dry. TD 950 ft.

E. W. Moran 1 Baker, on SW boundary line of J. B. Miller Sur., A-460. Dry. TD 7,060 ft. Marble Falls 7,018 ft.

Wichita County: Alexander Goldsmith 1 Kempner, Blk. 53, Kemps WVFL, A-542. Dry. TD 4,201 ft.

Wilbarger County: George Blackerby 1 Waggoner, 7-4-H&TC. Dry. TD 2,405 ft.

Dublin & Kiel 1-R Waggoner, J. Calhoun Spr. Dry. TD 2,505 ft.

Wise County: Oil Capitol Corp. 1 Craft, R. Turner Sur., A-820. Dry. TD 6,041 ft. Caddo 5,615 ft.

Young County: A. R. Dillard 1 Barnett & Gibbs, Sec. 2245, TE&L Sur., A-1078. IPP 29 BO in 16 rh., 40°, pay 2,880 ft. TD 4,016 ft.

T. V. Gorman 1 Edwards, TE&L Sur. 1499, A-925. Dry. TD 3,816 ft.

Munhall & Sparks 1 Brosn Estate, Sec. 612, TE&L Sur. Dry. TD 460 ft.

Revier, Mort & Lofton 1 Newman, Susan Sallie Sur., A-252. Dry. TD 3,607 ft.

STOCK TANKS
ENGINEERED TO LAST

Yes, Welded Tanks, Oil and Gas Separators, Heaters, Settling Tanks and Tool Houses are all Engineered to give maximum performance.

INDEPENDENT TANK COMPANY
BOX 1354 SEMINOLE, OKLA. • PHONE 977

Tennessee Production Co. 1-E Stewart, Blk. 1, Young CSL Sur. Dry. TD 3,635 ft.

G. H. Moore 1 Dragoo, Gal & Brown Navigation Co. Sur. 2, A-120. Dry. TD 570 ft.

WEST TEXAS

Andrews County: Pan American Production Co. 1 Anderson, 13-31-T2N-T&P. Dry. TD 7,720 ft.

Phillips Petroleum Co. 5-CC University, 42-5-University Lands. IP 934 BOPD, ¼-in., 43°, Devonian 12,480 ft. TD 13,888 ft.

The Texas Co. 1-AT State, 10-3-University Lands. Dry. TD 12,736 ft. Elev. 3,104 ft., Devonian 12,642 ft.

Borden County: Russell Maguire et al 1 Shockley, 86-25-H&TC. Dry. TD 7,346 ft. Elev. 2,318 ft., Canyon reef 7,320 ft.

Pan American Production Co. 1 Wolf, 41-25-H&TC. Dry. TD 7,360 ft. Elev. 2,337 ft., Canyon reef 7,332 ft.

Crockett County: Oliver & Kotyza 1-A Jeff Owens, Blk. 11, A. Lazo Sur. Dry. TD 2,006 ft.

Culberson County: William H. Hunt 1 Rounsaville, 22-108-PSL. Dry. TD 10,939 ft. Elev. 4,157 ft., Cherry Canyon 1,505 ft., Bone Springs 3,840 ft., Wolfcamp 6,770 ft.

Howard County: Heard & Heyser 1 O'Daniel, 37-27-H&TC. Dry. TD 8,215 ft. Elev. 2,418 ft., Canyon reef 7,850 ft.

Russell Maguire 1 Chandler, 11-25-H&TC. IP 184 BOPD, 30 64-in., 47°, reef pay 7,580 ft. TD 8,335 ft.

R. J. Zonne 1 Simpson, 8-31-T2N-T&P. Dry. TD 9,717 ft. Elev. 2,689 ft., Ellenburger 9,690 ft.

Mitchell County: Hanley Co. 1 Barron, 36-25-T&P. Dry. TD 7,545 ft. Elev. 2,263 ft., Ellenburger 7,339 ft.

Pecos County: Humble Oil & Refining Co. 11-D Tyrell, Sec. 508, Garcia, Montez & Duran Sur. Dry. TD 3,011 ft.

Runnels County: Thos. D. Humphrey & Sons 1 Halfmann, GH&H Sur. 501. Dry. TD 4,953 ft. Eelev 1,723 ft., Ellenburger 4,322 ft.

Schleicher County: C. L. Norsworthy Jr. 2 Willoughby, 147-A-HE&WT. Dry. TD 7,712 ft. Elev. 2,392 ft., Ellenburger 7,457 ft.

Sinclair Oil & Gas Co. 1 Smith, 148-A-HE&WT. Dry. TD 7,500 ft. Elev. 2,261 ft., Ellenburger 7,215 ft.

Taylor Oil & Gas Co. 1 Isaacs, 32-I-GH&SA. Dry. TD 6,410 ft. Elev. 2,283 ft., Ellenburger 5,638 ft., Cambrian 6,106 ft.

Sterling County: Sam D. Ares 1 McEntire, 8-23-H&TC. Dry. TD 2,563 ft.

Sutton County: American Trading & Production Co. 1 Allison, 8-B-HE&WT. Dry. TD 6,999 ft. Eelev. 2,294 ft., Ellenburger 6,540 ft.

Tom Green County: Woodward & Co. and Dan Auld 1 York, Sec. 44, District 11, SPRR Sur. Dry. TD 5,100 ft. Elev. 1,871 ft., Ellenburger 4,868 ft.

Ward County: Kerr-McGee 1 University, 25-16-University Lands. Dry. TD 10,550 ft. Elev. 2,612 ft., Wolfcamp 10,230 ft.

Yoakum County: A. O. Wellman & Sons et al 1-S Fields, 104-D-J. H. Gibson Sur. Dry. TD 5,220 ft.

SOUTHEAST NEW MEXICO

Lea County: Continental Oil Co. 1-29 Federal 29-26s-32e. Dry. TD 4,621 ft.

C. E. Marsh 1 Federal-Hall, 10-26s-32e. Dry. TD 4,590 ft.

NORTHERN NEW MEXICO

McKinley County: Great Western Drilling Co. 1 Santa Fe, C SE SW 26-20n-11w. Completed as water well. TD 3,311 ft. 2nd Dakota.

Rio Arriba County: Continental Oil Co. 1 Jicarilla, SE NE NE 30-25n-4w. Dry. TD 8,715 ft. in Chinle.

San Juan County, North Kirtland: Lucille H. Pipkin 1 Pipkin, S½ NE NE 13-20n-14w. IP 582 M.c.f. of gas per day. TD 812 ft. Pictured Cliffs. Pictured Cliffs discovery, new field.

Sandoval County: Royal Development 1 Clary, C SE SE 7-20n-3w. Dry. TD 3,291 ft. in Mancos. Temp. abd.

San Juan Drilling Co. 1 Vanderslice, NE SW SW 21-23n-4w. Dry. TD 7,852 ft. in Entrada.

ILLINOIS

Bond County: The Texas Co. 1 Kendall, SW SE NW 28-4n-2w. Dry. TD 2,700 ft.

Christian County: Lester Walker 1 Elliott, SE NE SE 32-16n-1w. Dry. TD 1,888 ft.

S. S. Dodson 1 Copenbarger, SW SW NE 27-16n-1w. Dry. TD 1,865 ft.

Clinton County: L. Kapp 1 Reinkensmeyer, NW SE NE 4-1n-1w. Dry. TD 1,485 ft.

Homer Rutherford 1 Klein, SE NE NW 18-1n-1w. Dry. TD 1,376 ft.

Marion County: W. E. Weidler 1 Davis, SW SW NE 31-4n-1e. Dry. TD 1,682 ft.

Morgan County: E. L. Wirth 1 Keltner, SW SE NE 23-16n-9w. Dry. TD 405 ft.

O. A. Reed 1 Lewis, SE SW NW 4-16n-9w. Dry. TD 325 ft.

INDIANA

Knox County: W. W. Dayton 1 Clark, Sur. 32-2n-9w. Dry. TD 1,636 ft.

WILDCAT COMPLETIONS

HIGHER RECOVERY
FASTER CORING TIME
FEWER TRIPS
DRILLING & SERVICE
DIAMOND WIRE LINE
CORE BARRELS
Now available in four sizes: 4¼" OD, 4½" OD, 5¼" OD, and 6⅞" OD to cut hole from 4½" diameter up.
Whether in slim-hole or conventional drilling, D & S Diamond Equipment for wire line coring will merit consideration.
TRUCO DIAMOND BITS
D & S CORE BARRELS
DRILLING & SERVICE

THE OIL AND GAS JOURNAL

"Oh, we can talk for hours—the old buzzard left for 2 days in the field."

WILDCAT COMPLETIONS

Spencer County: White & Vickery 1 Payton, NE NW SE 32-7s-7w. Dry. TD 1,435 ft.
Vigo County: J. D. Clouse 1 Fee, NE SW SE 9-12n-10w. Dry. TD 2,055 ft.

WESTERN KENTUCKY

Henderson County: F. S. Stephenson 1 Duncan, CWL SW SE NE 2-P-21. IPP 40 BOPD, Cypress sand 2,287-95 ft. TD 2,295 ft. (Opens Smith Mills East pool.)
Logan County: J. H. O'Dell 1 Wilhelm, W½ SE SW SW 15-E-32. Dry. TD 1,440 ft.
Paul McGinley 1 Gibson, NW SW SW NE 8-E-34. Dry. TD 1,515 ft.

MICHIGAN

Kent County: Clarence N. Crawford 1 May, NE NE SW 5-8n-12w. Dry. TD 2,341 ft. in Traverse lime.
Osceola County: The Moco 1 Heckert et al, NW SE NE 2-17n-8w. Dry. TD 3,850 ft. in Dundee lime.
Washtenaw County: John D. S. Hanson 1 Schield, SE SE NE 18-4s-4e. Dry. TD 1,414 ft. in Dundee lime.

PENNSYLVANIA

Indiana County, Pine Township: Charles E. Fralich 1 Charles Liesowity, 500,000 cu. ft. gas, Oriskany sand, 8,146-8,158 ft., gas, 8,146 ft., TD 8,166 ft.

WEST VIRGINIA

Preston County, Union district: Columbian Carbon Co. 1-1196 Robert Breedlove, elevation 2,546 ft., 4,727,000 cu. ft. gas, after Hydrafac, rock pressure 1,860 psi. in 15 hours, chert 4,777 ft., gas 4,817 ft., Oriskany sand 4,922 ft., TD 5,050 ft.

FLORIDA

Dade County: Gulf Oil Corp. State of Florida Lease 340, 18-54s-36e. IPP 113 bbl. of oil per day, 21.2°, Sunniland lime. TD 11,357 ft. (Forty Mile Bend pool area).

ALABAMA

Lowndes County: Ralph Williams 1 Wright, C NW SW 9-13n-15e. Dry. TD 2,278 ft.

MISSISSIPPI

Adams County: W. L. Billups 1 Jones et al, 63-6n-2w. Dry. TD 6,507 ft.
Est. Wm. Helis-Southern Production Co. C-2 Springfield, 22-5n-2w. Dry. TD 6,853 ft.
Jefferson County: John S. Calhoun-D. A. Rigland D-1 Armstrong, 36-8n-1w. Dry. TD 6,508 ft.
J. Paul Ratliff, Jr. B-1 Johnson, 11-9n-1w. Dry. TD 6,010 ft.
Pearl River County: Jett Drilling Co. 1 Beal, 5-1s-14w. Dry. TD 9,001 ft.

SOUTH LOUISIANA

Assumption Parish: Union Oil Co. of California 1 Williams, Inc., 30-15s-14e. IPF 250 BOPD, ⅛-in., 41.7°, perfs. 13,375-397 ft. TD 14,491 ft. (Oil discovery).

NORTH LOUISIANA

Bossier Parish: Lion Oil Co. 1 Doles, C NW SW SW 29-21n-13w. IPF 55 BOPD, Buckrange 1,928-34 ft., 23°, 21/64-in. TD 3,255 ft. (Oil discovery).
Carter Oil Co. 1 Young, C SW NE 28-21n-11w. IPF 97 BCPD, Davis 9,056-60 ft., 50.2°, 14/64-in. TD 9,125 ft. (New condensate pay at Ivan field).
Caddo Parish: Smith & Cameron-T. J. Johnson, and J. R. Shelton 1 Grayson Lumber Co., 30-19-15w. Dry. TD 6,160 ft.
Catahoula Parish: E. C. Wentworth and Como Drilling Co. 1 Fritz, 37-1n-6e. Dry. TD 6,011 ft.
Concordia Parish: R. A. Campbell C-3 Yakey, 26-4n-8e. Dry. TD 7,205 ft.

ARKANSAS

Hempstead County: Hurley & Beene 1 Jones, 22-14s-24w. Dry. TD 6,278 ft.
Lafayette County: W. & W. Drilling Co. 1 Wycoff, 12-16s-24w. Dry. TD 2,760 ft.
Logan County: Western Natural Gas Co. 1 Gray, C SW SE 25-8n-24w. IP 88 M.c.f. of gas per day 1,370-1,402 ft. TD 7,874 ft. (Shut in gas well).
Miller County: F. S. Kelly and Paul R. Davis 1 State National Bank, C SE SW 30-17s-26w. Dry. TD 6,008 ft.
Nevada County: Stuart & Warmack A-1 Foster-Grayson Lumber Co., C NE NE SW 15-14s-23w. Dry. TD 3,007 ft.
Sebastian County: Western Natural Gas Co. 1 Bergkamp, 1-7n-30w. IP 196 M.c.f. of dry gas per day, 5,920-41 and 5,986-6,012 ft. TD 8,323 ft. (Shut in gas well).

OKLAHOMA

Delaware County: Commercial Drilling Co. 1 Gardner, SW SW NW 17-23n-25e. Dry. TD 872 ft.
Garfield County: Atlantic Refining Co. and Mid-Continent Petroleum Corp. 1 Kruse, SW SW NW 19-22n-4w. Dry. TD 6,946 ft.
Oklahoma Petroleum Corp. 1 Johnson, SW SE SW 22-22n-3w. IPF 100 BOPD, Crews sand, ¾-in., 42°. TD 2,080 ft. (Oil discovery.)

(Continued on page 352)

WHITMOR'S
LEASE-RENTAL
PLAN

. . . without actually owning them!

The Whitmor Lease-Rental Plan is popular with companies that want the use of distinctive field homes without actually owning them — they require no capital investment. You can take advantage of Lease-Rental two ways . . . 1. Whitmor will build your entire camp — homes, offices, warehouses, recreational buildings, streets utilities, then lease it to you for 20 years or . . . 2. Whitmor will buy lots in the nearest town, build homes and lease them to you.

Get all the facts on Lease-Rental and how it will work to solve your field housing needs. Write today for descriptive literature.

WHITMOR HOMEBUILDERS INC.

INDUSTRIAL HOUSING | THE FINEST IN THE FIELD

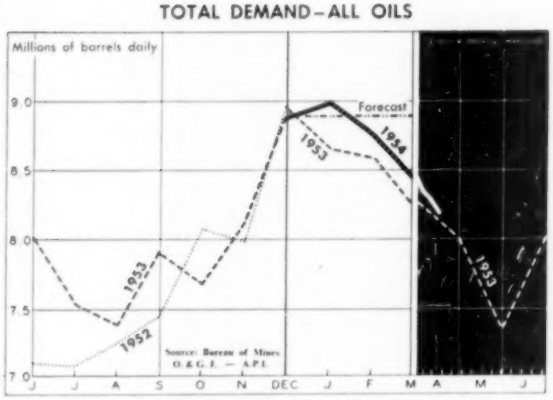
5525 EAST 15TH STREET • BOX 5037—TULSA, OKLAHOMA • PHONE 6-1137

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,578,875	UP	21,650	UP	312,600
Crude stocks	269,236,000	UP	689,000	DOWN	5,728,000
Completions	1,037	DOWN	11	UP	99
Refinery runs	6,915,000	UP	156,000	UP	229,000
Four-product stocks	296,749,000	DOWN	1,854,000	UP	19,476,000
Total imports	744,900	DOWN	305,700	DOWN	188,100

TOTAL DEMAND—ALL OILS



Demand in April May Not Indicate Summer Trends

APRIL is a transition month for consumption of petroleum products, and the rapid changes in product demand during the month may make it a poor base from which to forecast summer demands.

For the 4-week period ended April 10, total demand for all petroleum products was up about 2.6 per cent from the same period last year. However, comparison by products gives little indication of summer trends. Gasoline for the 4-week period represented a gain of only about 1.5 per cent over the same weeks last year, but most forecasts call for a seasonal increase of about 4 per cent.

Short periods of cold weather within the past 4 weeks tended to keep middle-distillate demand at a relatively high level. Calculated demand totals show a gain of about 10 per cent for kerosine and distillate, but consumption will decrease rapidly during the next few weeks.

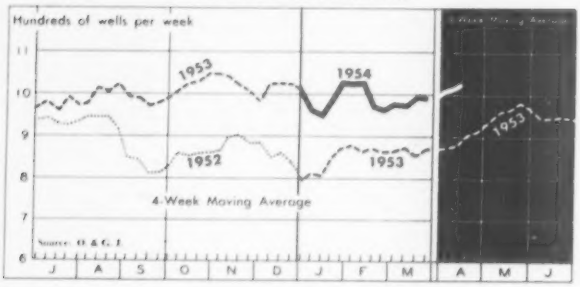
Small percentage gains . . . Suppliers should plan for only a small increase in total demand for the second quarter compared with last year. The small gain will not result from any lack of growth in consumption, but will be due to the fact that the indicated demand for June 1953 was inflated by adidtions to secondary and consumer storage.

Crude prices were increased at the middle of June, but there was a time lag between the crude increase and higher product prices. Jobber and consumer purchases were well above normal for the last half of June. If refiners consider June of last year as normal and turn out enough finished products for even a moderate increase in June this year, adjustments will have to be made in late-summer operations in order to prevent another stock surplus at the end of the season.

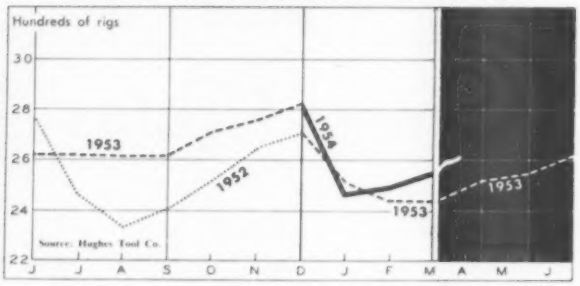
Market trends . . . Sales of light heating oils on the East Coast are reported to be limited to regular contract shipments. Suppliers have tried for the past few years to boost early sales of home-heating oils through summer discounts. Both jobbers and consumers are waiting for an announcement of discounts for this summer.

Motor fuel vs. natural . . . Many marketers are expecting some improvement in the natural-gasoline market by the middle of May. The spread between regular gasoline prices and the current quotations for natural is at all-time record. With Grade 26-70 natural moving at 4.0 cents a gallon on the Group 3 market, the Group 3 low for regular gasoline is 6.75 cents above natural. Natural gasoline has sold for less in the past, but only at times when regular gasoline was well below present quotations.

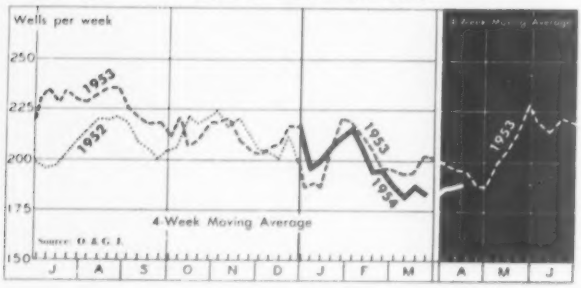
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

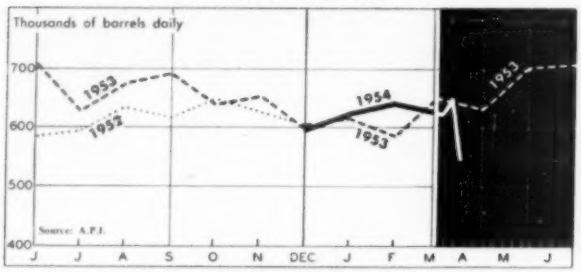
Area—	4-19-54	Change from 4-12-54	Change from 4-20-53
Gulf Coast	571	9	—39
N. and W. Texas-New Mexico	817	13	6
Ark.-N. La.-E. Texas	186	— 6	56
Oklahoma	378	— 4	40
Kansas-S. Nebraska	158	3	—15
Illinois-Eastern	113	— 9	5
Rocky Mountain	247	7	42
Pacific Coast	136	— 4	—34
Total United States	2,606	9	61
Western Canada	146	— 5	14

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 17, 1954

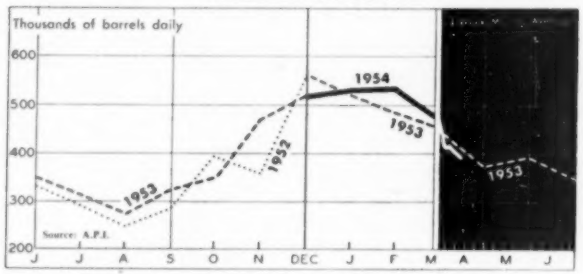
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1954				
	Comp.	Oil	Gas	Dry	Footage	1954	1953	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	1	0	1	13,635	37	40	1	0	0	1	2	2	0	1	30	33
Arkansas	15	5	2	8	72,241	215	141	0	0	2	4	6	8	0	2	32	42
California	46	29	0	*17	222,667	723	730	1	1	0	12	14	26	1	5	154	186
Colorado	26	15	0	11	139,539	349	150	1	0	0	9	10	12	0	0	124	136
Illinois	53	25	0	28	124,591	763	488	0	0	0	8	8	2	0	0	128	130
Indiana	9	3	0	6	14,423	223	348	0	0	0	3	3	3	0	0	56	59
Kansas	62	32	9	21	213,449	1,295	1,409	1	0	1	4	6	20	0	6	159	185
Kentucky	26	12	8	6	58,339	320	289	1	0	0	2	3	7	0	0	33	40
Louisiana	51	36	8	7	245,865	986	733	2	0	1	3	6	31	17	9	81	138
North	38	28	4	6	130,147	530	325	1	0	1	3	5	5	0	2	30	37
South	13	8	4	1	115,718	456	408	1	0	0	0	1	26	17	7	51	101
Michigan	7	3	0	4	25,267	172	155	0	0	0	3	3	3	0	0	73	76
Mississippi	14	5	0	9	115,362	115	105	0	0	0	5	5	2	0	0	41	43
Montana	6	4	0	2	32,527	85	115	0	0	0	2	2	1	0	0	25	26
Nebraska	4	4	0	0	22,180	99	85	1	0	0	0	1	7	0	0	28	35
New Mexico	24	10	7	7	107,466	349	403	0	0	1	6	7	7	0	3	47	57
North Dakota	6	3	0	3	58,796	64	71	0	0	0	3	3	3	0	0	17	20
Ohio	24	14	3	†7	53,469	321	293	0	0	0	0	0	0	0	2	3	5
Oklahoma	184	105	23	*56	617,095	2,776	2,086	5	0	0	12	17	38	2	8	181	229
Pennsylvania-New York	45	22	3	‡20	76,797	717	679	0	0	1	0	1	0	0	3	10	13
Texas	351	199	36	116	1,689,884	5,280	4,951	13	0	4	79	96	212	26	47	1,177	1,462
Southwest (1 & 4)	60	31	3	26	264,867	768	801	1	0	1	20	22	20	15	14	210	259
Gulf Coast (2 & 3)	54	42	4	8	365,267	829	739	4	0	0	7	11	24	9	13	193	239
East (5 & 6)	14	4	3	7	79,432	256	237	1	0	1	4	6	6	0	5	68	79
North Central (7-B & 9)	107	57	1	49	373,540	1,945	1,808	5	0	0	29	34	101	2	5	469	577
West (7-C & 8)	82	57	0	25	489,565	1,212	1,105	2	0	0	18	20	61	0	6	217	284
Panhandle (10)	34	8	25	1	117,213	270	261	0	0	2	1	3	0	0	4	20	24
Utah	5	0	0	5	23,683	22	24	0	0	0	5	5	2	0	0	13	15
West Virginia	18	2	16	0	39,264	165	164	0	0	1	0	1	0	0	7	5	12
Wyoming	37	23	0	14	186,042	462	177	3	0	0	8	11	17	0	2	60	79
Miscellaneous (Mo.)	22	19	0	3	24,264	75	16	0	0	0	0	0	1	0	0	9	10
Total United States	**1,037**	571	115	351	4,176,845	15,613	13,652	29	1	11	169	**210**	404	46	95	2,486	3,031
Total previous week	1,048	600	47	401	4,143,759			21	4	5	167	197	375	45	84	2,317	2,821
Total April 18, 1953	938	485	78	375	3,603,735			22	3	3	171	199	410	28	102	2,548	3,088

Service wells included: *1, †2, ‡18.

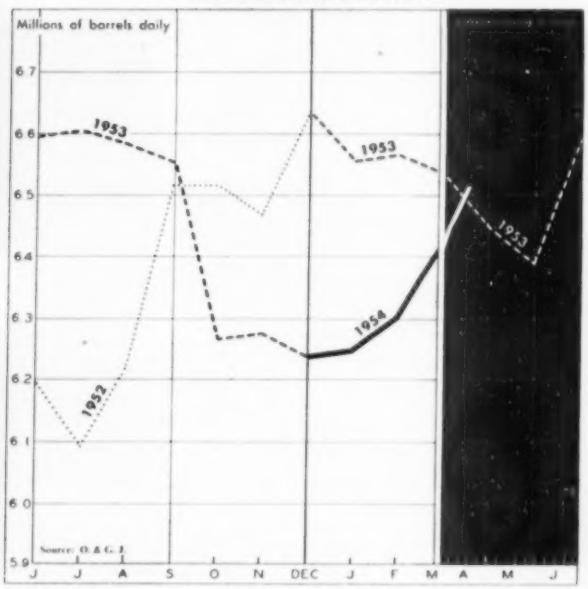
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



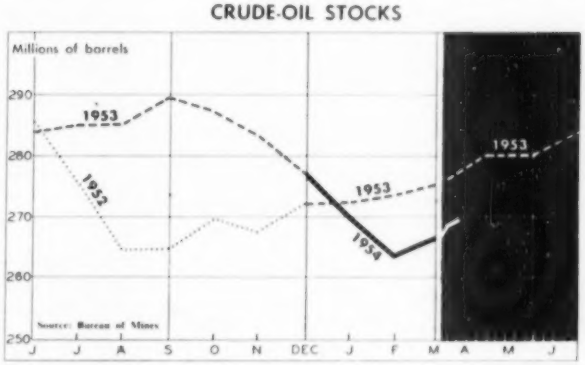
DAILY AVERAGE PRODUCTION FOR WEEK

	April 17			April 10
	Crude oil	Lease condensate	Total	total
Alabama	4,100		4,100	4,200
Arkansas	76,700	600	77,300	76,700
California	988,700		988,700	989,400
Colorado	126,200		126,200	121,700
Eastern	54,500		54,500	54,500
Florida	1,525		1,525	1,525
Illinois	176,600		176,600	176,700
Indiana	31,400		31,400	31,900
Kansas	333,800		333,800	331,900
Kentucky	35,600		35,600	35,600
Louisiana	678,050	47,450	725,500	723,250
North	108,050	3,950	112,000	109,750
South	570,000	43,500	613,500	613,500
Michigan	34,700		34,700	35,400
Mississippi	88,000	3,800	91,800	92,000
Montana	36,200		36,200	30,100
Nebraska	19,800		19,800	19,500
New Mexico	206,600	1,700	208,300	208,400
Oklahoma	526,200		526,200	519,800
Texas	2,800,000	51,250	2,851,250	2,851,250
Dist. 1	41,500	425	41,925	41,925
Dist. 2	148,200	7,500	155,700	155,700
Dist. 3	433,000	24,250	457,250	457,250
Dist. 4	256,500	5,900	262,400	262,400
Dist. 5	48,000	450	48,450	48,450
Dist. 6	118,500	5,800	124,300	124,300
East Texas field	248,800		248,800	248,800
Dist. 7-B	139,000	50	139,050	139,050
Dist. 7-C	184,000	4,750	188,750	188,750
Dist. 8	902,000	1,500	903,500	903,500
Dist. 9	194,000	600	194,600	194,600
Dist. 10	86,500	25	86,525	86,525
Utah	5,400		5,400	4,800
Wyoming	235,200		235,200	234,100
North Dakota	14,800		14,800	14,500
Total U. S.	6,474,075	104,800	**6,578,875**	6,557,225
Change from previous week,			**up 21,650**	
Canada	180,775		180,775	175,125

Total U. S. production January 1-April 17 ..... 683,019,950 bbl.
Same period last year (crude plus cond.) ..... *699,100,160 bbl.

*Includes 10,050,875 bbl. condensate.

CRUDE-OIL STOCKS



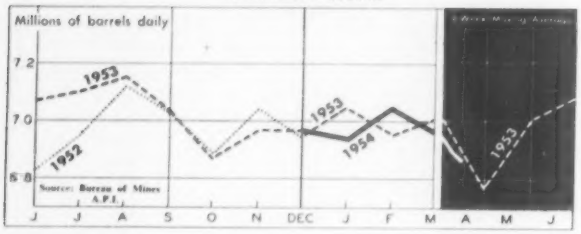
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

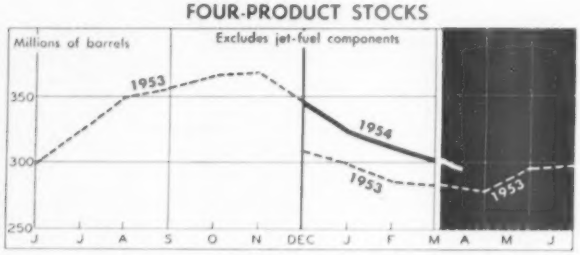
	Apr. 10, '54	Apr. 3, '54	Apr. 11, '53
Pennsylvania Grade	2,945	2,791	2,499
Other Appalachian	1,664	1,791	1,740
Illinois, Indiana, Michigan	12,110	12,507	10,632
Kansas	9,922	9,537	10,704
Oklahoma	26,508	25,472	26,947
Arkansas	3,218	3,075	3,058
Louisiana	14,545	14,266	16,658
North	2,532	2,510	2,770
Gulf	12,013	11,756	13,888
Mississippi	3,533	3,315	3,995
New Mexico	7,787	7,467	7,206
Texas	123,592	125,072	134,236
East Texas proper	10,351	10,793	11,389
West Texas	53,516	54,092	62,394
Texas Gulf	26,343	26,014	26,353
Other Texas	33,382	34,173	34,100
Wyoming	13,728	13,808	14,128
Other Rocky Mountain	3,716	3,783	2,565
California	34,814	34,778	32,610
Foreign	†11,154	10,885	7,986
Total	269,236	268,547	274,964

*Bureau of Mines. †Includes 2,662,000 bbl. in California.

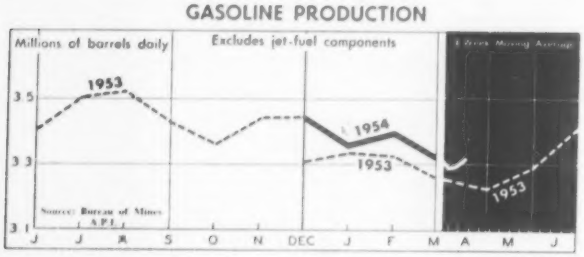
REFINERY RUNS



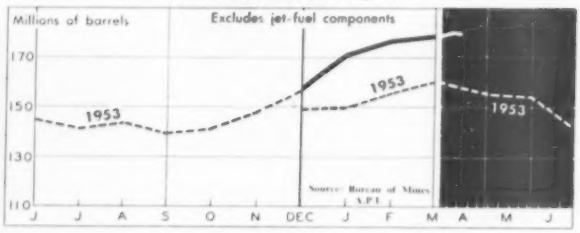
FOUR-PRODUCT STOCKS



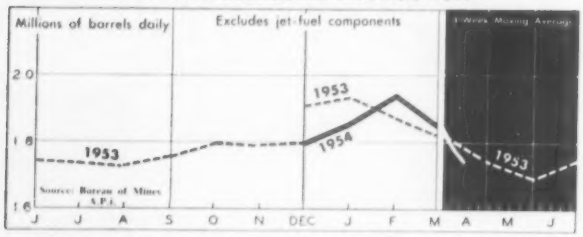
GASOLINE PRODUCTION



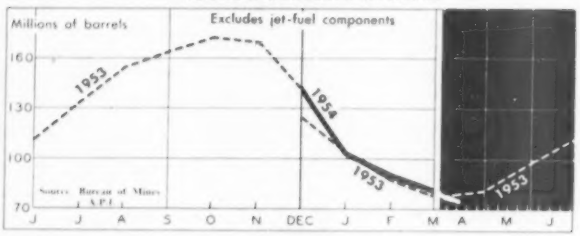
GASOLINE STOCKS



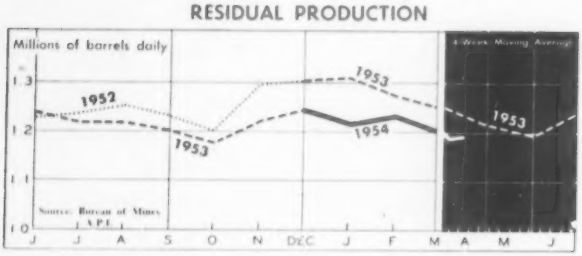
MIDDLE-DISTILLATE PRODUCTION



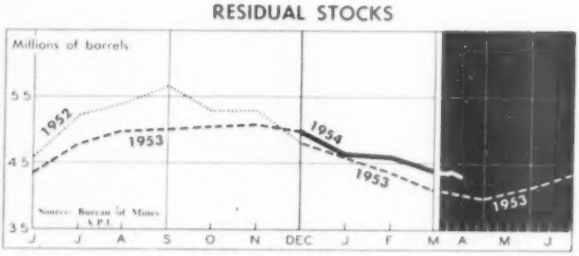
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 17

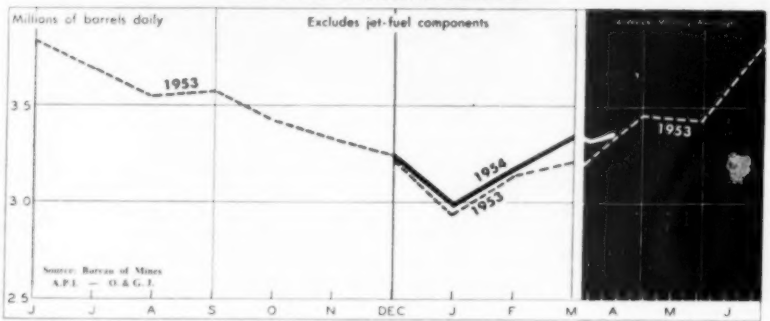
(Excludes all jet-fuel components)

(Thousands of barrels)

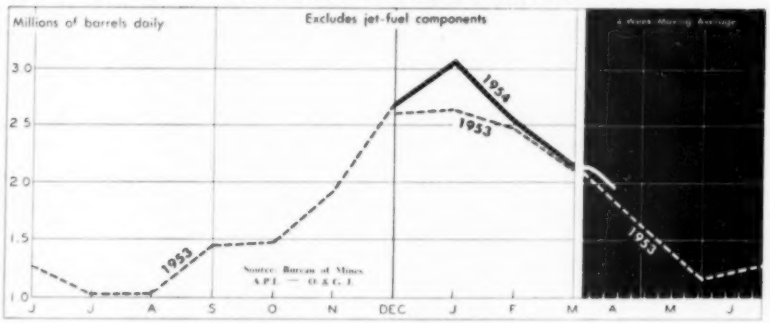
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1953 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,001	435.3	42.7	243.4	191.7	37,197	7,440	17,951	7,995	997	385.2	44.5	227.6	229.3
Appalachian:														
District 1	109	39.4	3.6	23.0	10.4	4,527	395	946	601	104	41.7	4.7	20.5	14.7
District 2	80	46.3	4.4	16.3	10.9	2,509	257	411	396	80	44.0	4.8	14.3	13.9
Ind., Ill., Ky	1,224	688.8	75.0	228.4	174.4	39,630	3,480	8,801	4,239	1,149	617.2	65.4	193.2	153.7
Okla., Kans., Mo.	595	347.7	14.7	147.3	43.6	20,354	1,081	6,592	1,256	556	310.6	17.8	121.2	54.5
Inland Texas	237	165.8	12.8	39.6	23.6	7,226	287	1,015	1,252	259	171.2	12.1	42.5	35.8
Texas Gulf Coast	1,775	792.2	93.2	384.0	265.6	23,432	2,165	6,432	4,752	1,726	793.0	131.3	409.6	248.2
La. Gulf Coast	534	273.3	41.0	128.2	54.4	8,675	1,452	2,755	1,165	553	267.6	41.0	149.2	55.5
N. La. and Ark.	90	35.6	8.3	19.6	5.8	4,368	478	764	131	86	34.1	8.5	20.6	7.1
Rocky Mountain:														
New Mexico	18	10.4	0.6	2.7	2.6	194		68	42	21	13.5	0.4	2.7	4.3
Other Rocky Mt.	196	113.3	2.3	43.4	39.7	8,311	156	1,689	719	207	101.4	2.4	49.1	36.4
California	1,056	423.0	4.1	135.7	385.0	22,500	336	9,610	20,717	1,043	444.5	7.5	164.0	365.7
Apr. 17, 1954	6,915	3,371.1	302.7	1,411.6	1,207.7	178,923	17,527	57,034	43,265	6,781	3,224.0	340.4	1,414.5	1,219.1
Apr. 10, 1954	6,759	3,271.1	338.4	1,342.7	1,207.3	179,729	17,269	57,772	43,833					
Apr. 18, 1953	6,686	3,190.1	360.6	1,356.0	1,243.0	156,663	19,285	61,474	39,851					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

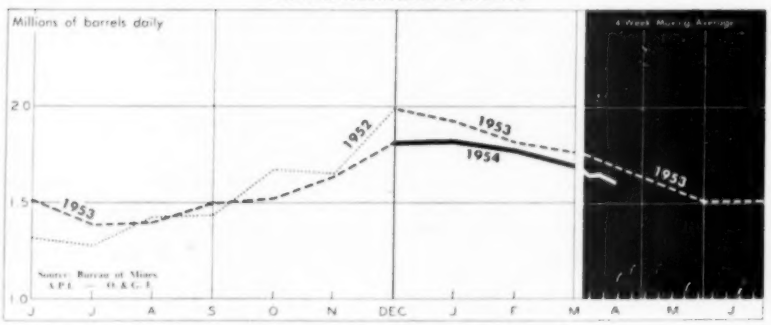
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of April 21, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11	11.5-12.25	10.25-10.5
Premium gasoline	11.75-12	13.25-14	11.5-12.25
42-44 w.w. kerosine	9.125-9.375	10.2-10.4	9.25-9.5
No. 2 straw fuel oil	8.25-8.375	9.2-9.4	8.25-8.5
No. 6 residual	$1.15-1.30	$2.20-2.40	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.0	3.5	3.75
Grade 18-55	4.8	4.3	4.55

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Reductions in quotations for residual fuel by some Mid-Continent suppliers cannot be explained by decreases in demand. New coking units to be started later in the year are expected to take any of the distress fuel at the end of summer.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 4-17-54	3,320	3,365
January 1954	3,354	2,985
April 1953	3,224	3,473
March 1953	3,269	3,215
Middle distillate:		
Four weeks ended 4-17-54	1,738	1,966
January 1954	1,857	3,075
April 1953	1,755	1,647
March 1953	1,824	2,119
Residual fuel:		
Four weeks ended 4-17-54	1,189	1,600
January 1954	1,271	1,835
April 1953	1,219	1,652
March 1953	1,256	1,778

GASOLINE CONSUMPTION BY STATES*

(Thousands of gallons)

	1953	1952
Alabama	726,091	685,486
Arizona	321,400	304,148
Arkansas	463,030	448,207
California	4,874,567	4,487,131
Colorado	540,433	525,684
Connecticut	609,965	573,906
Delaware	127,436	117,325
Dist. of Col.	204,230	201,617
Florida	1,138,973	1,057,776
Georgia	972,853	927,151
Idaho	233,142	220,490
Illinois	2,544,995	2,445,212
Indiana	1,497,229	1,393,038
Iowa	1,028,229	1,006,271
Kansas	882,165	831,535
Kentucky	686,466	656,183
Louisiana	703,182	651,426
Maine	264,702	252,601
Maryland	677,952	644,287
Massaschusetts	1,070,507	1,044,375
Michigan	2,305,731	2,129,577
Minnesota	1,044,388	1,003,968
Mississippi	520,935	498,665
Missouri	1,401,887	1,359,819
Montana	257,314	249,632
Nebraska	531,662	513,327
Nevada	105,815	95,918
New Hampshire	153,423	143,844
New Jersey	1,587,990	1,487,170
New Mexico	303,828	282,273
New York	3,134,505	2,941,456
North Carolina	1,144,530	1,084,672
North Dakota	291,319	279,159
Ohio	2,619,300	2,463,122
Oklahoma	811,757	793,402
Oregon	572,506	568,257
Pennsylvania	2,604,209	2,480,338
Rhode Island	201,115	188,748
South Carolina	588,434	581,024
South Dakota	308,803	296,467
Tennessee	818,644	830,198
Texas	4,613,630	3,933,866
Utah	257,562	239,221
Vermont	112,174	106,885
Virginia	1,047,179	997,342
Washington	795,594	759,398
West Virginia	417,239	407,574
Wisconsin	1,132,764	1,084,252
Wyoming	155,316	148,725
Total U. S.	49,467,100	46,428,148

*A.P.I.

(The schedule of selected crude prices appeared on page 278 of April 19 issue and will be printed again next week).

CLASSIFIED ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

UNDISPLAYED CLASSIFIED 20c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$14.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EQUIPMENT FOR SALE

FOR SALE: ENGINE—165 Hp. Climax T-61 on Skid. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

DRILLING equipment. New and used spudders, rotaries, tools. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colorado.

83 STAR SPUDDER with tools from 13" down to 5". Winch truck and all small tools. Reason for selling: illness. H. C. Full, RR #1, Box 249, Terre Haute, Indiana. Phone: CRawford 63013.

SEVERAL FAILING MODEL 1500 rigs, various ages, conditions and inventories. P. O. Box 643, Billings, Montana.

FOR SALE: Waukesha G.A.K. 145 H.P., like new, Twin Disc clutch, 12" V Shive. $1650.00. Box 583, Ardmore, Okla. Phone 4726.

PIPE. New seamless J55 mill end 5½" and 7" from Pueblo mill. Get our low prices. Pressey & Son, Pueblo, Colorado.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma

FOR SALE: 5½ Keystone spudder, with tools, lines, etc. Priced to sell. M. J. Regan Pipe Co., Coffeyville, Kans.

FAILING 1500 SS Rotary Drilling Rig. Heavy duty powered (2) Buda motors, gas or propane. 38' mast, Koehler light plant, 6 x 6 Mud pump. Mounted 6 x 6 G.M.C. truck. Chevrolet panel truck, 4 wheel pipe trailer (duals). Price $10,000. Complete except pipe. Write or call A. W. McPherson, 623 North Joplin St., Joplin, Mo. Phone 5453.

14 VARICYCLE PUMPING UNITS capable of pumping to depth of 5000'. $500.00 each. Dr. Sam G. Dunn, 1312 Main St., Lubbock, Texas.

250,000 FT. 8⅝ o.d. pipe with collar and plain end. $1.00 per foot Oklahoma. Rogers & Lundquist, 620 Wright Building, Tulsa, Okla. Phone 3-2072—5-8850.

FOR SALE: 10,341 ft. new 2⅜-in. drill tubing, 6.25 lb., J-55, E.U., Pittsburgh Acme, six-thread, with 500 N-80 couplings. Diamond Drilling Co. 2759 East Willow, Long Beach, Calif.

FOR SALE OR TRADE

36L Bucyrus-Erie Spudder equipped with Cummins Diesel. Would prefer trading for 28L.

VEEDER SUPPLY & DEVELOPMENT COMPANY
Cherryvale, Kansas

EQUIPMENT FOR SALE

FOR SALE: Two 18-trace sets of Reflection Seismograph instruments, Rack and Panel mounted. One set mounted in instrument cab, on 1951 GMC Truck, model 301-24. Very reasonably priced. Texas Seismograph Co. Box 2069. Phone 3-1493. Wichita Falls, Texas.

FOR SALE: 1—36L Bucyrus Rig, 1—C-37 Walker-Neer Rig, 1—RL3 Drum Cardwell Rig—all three complete with tools. Light plant, tool house and all accessories. Can be seen working now in West Texas. Contact by phone 2-4743 or write P. O. Box 2608, Midland, Texas.

1—Used Superior 90 H.P. Twin Duplex 2 Stage Gas Engine Compressor complete with Sturdevant Cooling System and Cooper-Bessemer Starting Compressor. Box H-149, The Oil and Gas Journal, Tulsa, Oklahoma.

SUPER ELECTRONIC Magnetometers, Scintillometers, Geiger Counters, Radioactive ores. Geoelectronic Scope Co., Route 11, Box 449, Fort Worth, Texas.

FAILING model heavy duty 1500 drill and water truck. Write to Box 819, Longmont, Colorado, for details.

FOR SALE: 5½" x 20" Class 'Y' Cooper Compressor Cylinders, 90 hp. Superior Compressor skid mounted, 4"—500 lbs. gate valves, electric driven centrifugal water pumps. Alfred B. Kern, 227 Wright Building, Tulsa 3, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

New lubricated plug cocks at interesting prices.

(13)—	½"	Nordco series		1500	#3044
(24)—	¾"	"	"	1500	#3044
(7)—	1"	"	"	1500	#3044
(8)—	1½"	"	"	1500	#3044
(7)—	4"	"	"	150	#1945-RJ
(2)—	4"	"	"	400	#2145-RJ
(2)—	4"	"	"	600	#2249-RF
(2)—	4"	"	"	900	#2345ME3-RF
(1)—	8"	"	"	300	#4285-RF
(3)—	8"	"	"	150	#1985RF
(2)—	1"	"	"	1500	#3045RJ*

*(W/rings, bolts & weld flanges.)

HENZE VALVE CO.
McCandless St., Linden, N. J.

EQUIPMENT FOR SALE

TWO R.L. CARDWELL DOUBLE-DRUM SPUDDERS with 85-ft., 4-leg masts, one with 185 hp. W.A.K. and other with 145 hp. G.A.K. Waukesha motor. Draw works and motors recently overhauled. Each has 9,000 ft. ¾ in. line and 8,000 ft. ⅝ in. line. Dog houses, small tools. S. R. Lesseig, GA 71932 or P.O. Box 6206, Okla. City, or W. D. Cunningham, 89K4, Alma, Okla.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered, on 3" C.C.; 2 unused, 1 slightly used. 11-Sperry 18" by 18" cast iron Filter Presses, 11 chambers. Consolidated Products Co., Inc., #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

1000' 13" OD 50# Lap Weld R-1 8-V Thd. #1 Used Casing. 5000' 8⅝" 32# Seamless R-2 8-V Thd. #1 Used Casing. Creston Supply Company, Daniel Bldg., Tulsa, Okla. Phone 54-6082.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WANTED: One good used 17½" oil bath rotary table. Contact Sellers. Box 606, Holdenville, Oklahoma, or phone 723.

WANTED: Good used Spudder for 2,000 to 2,500 feet drilling. Prefer 24-L or 28-L Bucyrus-Erie. Box H-161, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED CARDWELL MODEL Q hoist complete for second drum on Model K draw works. Must be bargain. Also want good mud pump, less engine. Box H-158, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED: Complete Rotary Rig, U 15 or National 50 Class, preferably located in West Texas. Box H-106, The Oil and Gas Journal, Tulsa, Oklahoma.

USED PULLING Machines, double drum and capable of servicing to 5500. Box 928, Midland, Texas.

WANT SINGLE or double drum pulling unit, truck trailer or skid mounted with single or double pole mast. Box G-981, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: One good used Walker-Neer Spudder or Bucyrus-Erie, capable of drilling 5,000 feet. Price must be right and in almost new condition. Box H-164, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

80,000 BBL. WIGGINS PONTOON FLOATING ROOF TANK

A.P.I. Chicago Bridge all welded 5 ring 120' x 40' located Brownstown, Ill. Price $17,500 as is or cut down match-marked, loaded on car $22,500.

Phone 3-6141 **W. C. Berry** **P. O. Box 1858** **Tulsa**

HELP WANTED

ENGINEER with structural experience and some knowledge of drilling equipment or methods desired by recognized oil field equipment company for contact work and sale of derricks and all related drilling structures. Box G-990, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL INDUSTRY Employment Service, Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. For technical and trained oil industry personnel. Write for blank.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

ENGINEER OR CHEMIST—with petroleum refinery experience, including fluid catalytic cracking, who is interested in the technical sales field. All replies will be considered as confidential. Apply Box H-166, The Oil and Gas Journal, Tulsa., Oklahoma, stating age, qualifications and salary requirements.

WATER FLOOD ENGINEER

With necessary experience to take charge of entire development and operation of three major floods and several minor floods in close proximity of each other. Must be thoroughly experienced and capable of daily supervision in field. Give education, experience, reference and or reply for more details. Interview will be granted if above requirements can be met. Address J. C. Miller, Box 247, Owensboro, Kentucky.

ENGINEER with structural experience and some knowledge of drilling equipment or methods desired by recognized oil field equipment company for contact work and sale of derricks and all related drilling structures. Box G-990, The Oil and Gas Journal, Tulsa, Oklahoma.

Oil and gas producing company needs junior seismologist or chief computer with two years minimum experience on field crew, including some field training. College graduate. Geology major preferred. Permanent location on general office geophysical staff in Gulf Coast area.

Box H-160
The Oil and Gas Journal
Tulsa, Oklahoma

FOR ENGINEERS, FIELD & OFFICE STAFF
—OILMEN CONSULT—
GOOD EMPLOYMENT AGENCY
Skilled free service by technicians.
Seismic Specialists
1554 California St. **AC. 0835**
Denver, Colorado **(24-hr. service)**

PETROLEUM OR RESERVOIR ENGINEER

With minimum 3 years' experience in development, production and oil and gas reservoir engineering on primary and secondary recovery problems. For New York office of major foreign producer. Write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OGJ-7
Arabian American Oil Company
505 Park Avenue
New York 22, N. Y.

HELP WANTED

PETROLEUM OR RESERVOIR ENGINEER

For New York office of major foreign producer. Proficient in mathematics with 4 or more years' extensive experience in oil and gas reservoir engineering on primary and secondary recovery problems. Duties will include preparations of basic field production and reservoir data for application in analogue and digital computors, performance of analytical analysis of field behavior and interpretation and preparation of resulting data for reservoir engineering reports on specific fields.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OG-1
Arabian American Oil Company
505 Park Avenue
New York 22, N. Y.

WANTED: Manufacturer's representative now calling on supply stores to represent old established manufacturer of sub surface pumping and production equipment. Several open territories. Box H-144, The Oil and Gas Journal, Tulsa, Oklahoma.

FIELD SUPERINTENDENT: Independent Producing Company needs mature man with considerable primary and secondary-recovery experience to manage large project in Mid-Continent area. Must have good knowledge of production, drilling and rework, and supervision of large field organization. State age, experience record, salary expected, and full details in first letter. Replies strictly confidential. Box H-157, The Oil and Gas Journal, Tulsa, Oklahoma.

Experienced products pipeline superintendent with minimum of five years experience on products pipelines. Must be qualified to take complete charge of new 12,000 BPD products line. Give complete data and salary expected. Replies strictly confidential. Box H-150, The Oil and Gas Journal, Tulsa, Oklahoma.

PHOTOGEOLOGIST—To head photogeolic interpretation section. Must be College graduate—5 years experience—mining experience desirable. Write giving age, education and full details of experience. All replies confidential. Box G-988, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY OPERATIONS SUPERVISOR for Northern Wisconsin refinery preferably with experience thermal cracking and asphalt production. Box H-168, The Oil and Gas Journal, Tulsa, Oklahoma.

SOUTH AMERICA. Major Oil Company. Our fee paid. Petroleum Engineer—Drilling Engineer—Electrical Engineer—All requiring degree, some experience, under 40. Toolpusher—3 or more years experience, under 40. General Clerk—2 or more years experience in production department, knowledge stenography desirable, under 32. All information confidential. Contact Chas. J. Loveless Personnel Service, 616 S. Main, Tulsa, Oklahoma. Phone 3-5168.

SUPERVISOR OF CATALYTIC CRACKING AND ALLIED OPERATIONS

Modern Mid-Continent refinery seeks man to supervise fluid catalytic cracking and allied operations. Must have fluid cracking and general refinery experience. College degree or equivalent. In reply please state qualifications. All replies confidential. Our employees know of this ad.

Box H-154, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

THE SUPERIOR OIL COMPANY has an opening in the Geophysical Department, starting as a computer. College degree in Geology, Geological or Petroleum Engineering required plus math through calculus and basic physics. No experience required. Send transcript, photo and letter of application to Personnel Department, The Superior Oil Company, Midland, Texas.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

GEOLOGIST - GEOPHYSICIST. Fourteen years experience. Seven years seismic supervisor Gulf Coast, Rocky Mountain Division and Canada. Desires position as coordinator, geologist-geophysicist, or manager uranium exploration with oil or mining company. Now residing Denver. Prefer Rocky Mountain Area. Box H-143, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER: B.S. and M.S. degrees. 6 years varied experience in petroleum development, production and reservoir engineering. Desires position in Texas-Louisiana area. Will consider other areas, including foreign. Box H-136, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, Master's degree, Age 27, single. Over two years experience, mostly on subsurface and regional studies. Will consider any locality. Box H-155, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES MANAGEMENT POSITION. Presently district manager national concern supervising eight-state area. Formerly sales manager industrial supply house specializing in air, oil, water, gas, steam, and hydraulic equipment. Four years oil-field experience. Thoroughly familiar Mid-Continent and Southern California areas. Present income $10,000 per year. Willing to relocate. Box H-156, The Oil and Gas Journal, Tulsa, Oklahoma.

CATALYST SALES ENG., now located on West Coast, familiar with small refineries, desires challenging position in sales or management. Box H-165, The Oil and Gas Journal, Tulsa, Oklhoma.

ARE YOU LOOKING FOR THIS MAN? Geological Engineer seven years thorough experience Petroleum Geology. Capable and well qualified. Seeks position with company operating in Mid-Continent or Rocky Mountain area. Box H-163, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLFUM ENGINEER: Age 30, 3½ years experience in production, drilling, well completion and remedial operations. Desires responsible position with independent in Mid-Continent or Rocky Mountain area. Box H-162, The Oil and Gas Journal, Tulsa, Oklahoma.

JUNIOR ACCOUNTANT, 26, single. Spanish and American College. Willing travel South America. Public Relations. References. Box H-159, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL COMPANY EXECUTIVE—Attorney under 45. Experienced in legal, leases, royalty, personnel, exploration, development, production, rotary contract drilling, and financing. 10 years manager and top executive positions in the oil industry. Presently employed. Box H-147, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628. Ph. No. 3-3141, Hobbs, New Mexico.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

GEOPHYSICIST: Nine years seismograph experience Latin America—States; Age 38; Consider Foreign. Box H-139, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ENGINEER: Qualified for assistant manager or chief engineer. Experience—design, estimating, field, maintenance, contracts, organization, cost control, major construction. Box H-142, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

WANTED: STRIPPER PRODUCTION, Bartlesville sand, for water flood. Southeastern Kansas. Please give full information. Box G-996, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

DRILLING WILCOX TEST, offsetting old production. High possibilities, 16th interests for sale, escrow, references exchanged. Box H-167, The Oil and Gas Journal, Tulsa, Oklahoma.

80 ACRES, originally 7 producing wells, up to 75 bbl. 40 Gravity oil. Clean out for sand frac. 1/32—$100.00, 1/16—175.00, 1/8—$325.00. L. Price, Coweta, Oklahoma.

LEASES FOR SALE or DEAL—240 acres section 30-1-26, Decatur County, Kansas. 640 acres section 31-22-18, Pawnee County, Kansas, S½ of Section 11-2-27, Decatur County, Kansas. Box 527, Chappell, Neb.

320 ACRE PRODUCING OIL LEASE, Kansas, recent well, 1000 acres offset leases, Hunton and Viola production. R. D. Swan, Daniel Building, Tulsa.

WILL pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

MAKE ME A DEAL TO DRILL. 100 acres John Taylor Survey, Cherokee County, Texas. August J. Randa, 933 Caulder, Des Moines, Iowa. Phone 3-6193.

LEASES, DRLLING BLOCKS, all Southwestern States areas, bought and sold. Burkett, 3455 Johnette St., Shreveport, La.

SEE A. L. BOWLES, Box 947, Ada, Okla., for attractive drilling deals and producing royalties.

WILL LEASE for oil test 1040 acres 2½ miles from production. Western Ness County, Kansas. Leonard Ward, Alamota, Kansas.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

OIL & GAS STRUCTURES
SE New Mexico well to drill next to S.I.W. Showed for prod. 2 zones Permian. Interests available. SW Wyo.: well to drill major structure west of large prod. Frontier & Sundance sds. Data both areas on request.

W. J. PETERMAN, Geologist
1918-1954
Portales **New Mexico**

OVER $5,000,000.00 OIL PRODUCING PROPERTIES FOR SALE
Located in Texas and Oklahoma. Information furnished to qualified buyers only.

COMBEST ROYALTY COMPANY
Amarillo, Texas

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

ROYALTIES

OFFERING CHOICE ROYALTIES on geology in Oklahoma's greatest oil fields. A. S. Berry, 522 Wright Bldg., Phone 5-5402, Tulsa, Oklahoma.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

SERVICES

QUICK SERVICE PIPE DRILLER
Specialize in drilling out any size tubing, drill or line pipe plugged with cement, sand corrosion or paraffin. Drill and clean any size underground salt water lines. Operate in Texas and adjoining states. Call collect day or night: ME-2338. W. H. Anderson—1010 E. Cross Timbers, Houston 22, Texas.

BUSINESS OPPORTUNITIES

PARTNER WANTED: In developing an oil field along Ohio Valley and another in Mississippi. References exchanged. Details after personal contact. W. R. Bedingfield, 822 Southern Finance Bldg., Augusta, Georgia.

PROFITABLE REFINERY, 1000 bbl. daily capacity, thermo cracking unit, manufacturing ethyl and regular motor fuels. Plentiful crude supply and barge transportation nearby. Wire, write or phone Paul E. Parsons, P. O. Box 538, Phone 1472, Jennings, La.

ELECTRICAL CONTRACTORS

Office Phone 5-5315 — **Res. Phone** 7-4950

W. L. RATCLIFF COMPANY
ELECTRICAL CONTRACTORS
Industrial—Commercial—Distribution
W. L. Ratcliff — **506 Caddo St.**
P. O. Box 373 — **Shreveport, La.**

RANCHES

RANCH on White River. 1300 acres, Carroll County, Arkansas. Good hay meadows and pastures. Modern owner's lodge with two fireplaces. Modern foreman's house. Good modern barns, corrals. Fenced and cross-fenced. Nine improved permanent springs. Price $40,000. For details write C. C. King, Eureka Springs, Arkansas.

? ? THE BIG QUESTION ? ?

Is there any spot in this country that is ideal for farming?

The U. S. Weather Bureau Climate reports indicate there is no place that can touch Grants Pass, Oregon.

Factors making for Pleasant Living:
Lowest wind velocity in the U. S. A.

Mountainous appearance yet only 900 feet above sea level.

Fine Hunting and Fishing.
No Defense Industries.

Approx. 2½ hours flying time to Portland, 2 hr. 45 min. to San Francisco.
Analyze these facts then compare this fine Southern Oregon Stock Ranch: 776 Acres, 130 irrigated. Old water right. Many acres open meadow. Low plateau to general sloping tree-covered hillside terrain. New three-bedroom contemporary home blends with the natural beauty of its surroundings. 650-ton modern barn, work shop, storage sheds, plus two sets of farm buildings. Full line of farm machniery.

Where can you find all of the above for less than Two Hundred Thousand Dollars?

VALLEY FINANCE CO.
P.O. Box 135
Grants Pass, Oregon

WRITE FOR FREE BROCHURE

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

WILDCAT COMPLETIONS

(Continued from page 344)

Garvin County: Max Pray 1 Eason, SW SW 26-3n-4w. IPF 75 BDPD, 2,214 M.c.f. of gas, Hart sand 8,852-77 ft., 26/64-in., 67°. TD 10,635 ft. (Oil discovery.)

Shebester-Toland-Reeves, Inc. 1 Watson, SW SE SW 9-1n-1e. Dry. TD 5,211 ft.

Johnny Grimm et al 1 Wharton-Readnour, SW NW NE 13-2n-2e. Dry. TD 2,421 ft.

Kay County: Hill & Hill 1 Randel, SW SW NE 29-28n-3e. Dry. TD 3,388 ft.

Cyclone Drilling Co. 1 Chilocco Indian, NW NW NW 24-29n-2e. Dry. TD 3,431 ft.

Kiowa County: J. H. Riley et al 2 Pook, E½ SE NE 29-7n-16w. IPP 30 BOPD, 546-51 ft. TD 551 ft. (Oil well.)

Lincoln County: The Texas Co. 4 Frost, SW NE NW 18-12n-3e. IPF 121 BOPD, 40.7°, Hunton 5,274-80 ft. TD 5,477 ft. (New oil pay at Southwest Mammoth field.)

General Drilling Co. 1 Pollard, SE SE NW 14-12n-4e. Dry. TD 5,512 ft.

Sunray Oil Corp. and General 1 Lacquement, NW NW NW 35-12n-5e. Dry. TD 4,324 ft.

Viersen & Cochran 1 Bouda, SW NE SW 30-13n-6e. Dry. TD 4,634 ft.

Viersen & Hays and Means 1 Hoplins, NW SE NE 31-15n-6e. Dry. TD 3,394 ft.

Stephens County: Davenport Drilling Co. 1 Green, NE SW NE 20-2s-4w. Dry. TD 2,737 ft.

Altus Drilling Co. 1 Snodgrass, C SW SE 13-2n-4w. Dry. TD 11,115 ft.

J. A. Maurer 1 Maxwell, NW NW NW 30-2n-4w. IPP 28 BOPD, Permian sand 1,326-38 ft., 18°. TD 3,016 ft. (Oil discovery.)

KANSAS

Barton County: Lewis Drilling Co. 1 Welsh, SW NW SE 20-19s-12w. IPP 326 BOPD, Lansing 3,278-84 ft. TD 3,475 ft. (Opens James pool).

Clark County: Skelly Oil Co. 1 Harvey, SE SE NW 31-33s-24w. IP 500 M.c.f. of gas per day, Chester 5,436-44 and 5,502-20 ft. TD 5,826 ft. (extends McKinney gas field).

Dickinson County: Don Ingling 1 Flora, NE SE SW 11-13s-1. Dry. TD 3,208 ft.

Norton County: National Cooperative Refining Association 1 Stone, NW SE NE 30-4s-21w. Dry. TD 3,688 ft.

Sumner County: McGuire, Inc., 1 Johnson, NE NE NE 5-34s-1e. Dry. TD 3,200 ft.

Trego County: Lipp & Powell 1 Young, NW NE NE 26-15s-24w. Dry. TD 4,326 ft.

NEBRASKA

Cheyenne County, Bentley: Ohio Oil Co. 1 Rohlfing, NE SW NW 11-12n-52w. IPP 117 BOPD, "D" sand discovery, new field. TD 5,250 ft. PBTD 5,211 ft.

NORTH DAKOTA

Bowman County: Hunt Oil Co.-Zach Brooks 1 State, C NW NW 16-129n-104w. Dry. TD 10,006 ft. in Cambrian.

Golden Valley County, Trooters area: Gulf Oil Corp.-Northern Pacific 1 Govern-

WILDCAT COMPLETIONS

ment-Dorough, C NE SW 24-143n-103w. Dry. TD 13,373 ft. in Winnipeg.

Hettinger County, Tee Pee Buttes area: Socony-Vacuum F-14-24 Jacobs, C SW SW 24-134n-96w. Dry. TD 10,433 ft. in Red River.

CALIFORNIA

Fresno County: R. S. Rheem, Oper. 2-14 Zwang, 14-20s-15e. Dry. TD 8,110 ft.

Standard Oil Co. of California 85 27F, NE SE 27-20s-16e. IPF 940 BOPD 28/64-in. choke, 37° gravity, perfs. 8,576-8,650 ft., TD 8,652 ft. (Approx. ½ mile northwest extension to North Leda pool, Guijarral Hills field.)

Kern County: E. A. Bender, 58-24 K.C.L., 24-30-25e. Dry. TD 8,205 ft.

Richfield Oil Co. 72-35 San Emidio-E, 35-11n-22w. Dry. TD 7,558 ft.

S K L Associates 1 SKL, 15-28s-28e. Dry. Vedder 2,886 ft., TD 2,900 ft.

Standard Oil Co. of California 515 29R, IPF 23 bbl. condensate daily, 5,000 M.c.f. gas, 15/64-in. choke, 57.5° gravity, perfs. 9,050-9,813 ft. in Carneros (middle Miocene sand), TD 9,245 ft. (Approx. ½-mile east extension to Carneros pool, Elk Hills field.)

Kings County: J. B. Nelson 2 Morris, 30-23s-18. Dry. TD 933 ft.

Los Angeles County: M J M & M Oil Co. 1 Guyton, 22-5n-17w. Dry. TD 1,539 ft.

Madera County: LaBoa Exploration Co. 1 Well, 19-10s-18e. Dry. TD 2,246 ft.

Trico Oil & Gas Co. 1 Redman-Cook, 35-11s-14e. Dry. TD 4,004 ft.

San Bernardino County: Cajon Basin Co. 1 Carver, 14-3n-5w. Dry. TD 1,285 ft.

San Joaquin County: Standard Oil Co. of California 1 Patterson, 30-5n-5e. Dry. TD 9,001 ft.

Tulare County: Rhoads & Gilliam 1 Well, 34-22s-27e. Dry. TD 900 ft.

Ventura County: Continental Oil Co. et al 3 Janss, 22-2n-21w. Dry. TD 6,471 ft.

MONTANA

Pondera County: Pacific Northwest Oil & Gas Co. 1 Armstrong, CE ½ NW NW 22-26n-1w. Dry. TD 1,890 ft.

Valley County, East Porcupine Creek: Murphy Corp. 1 Firemoon, C SE SE 12-30n-41e. Dry. TD 8,247 ft. in Cambrian.

WYOMING

Carbon County, Muddy Gap: Wind River Oil Co. 1 Government, NW SW SW 22-27n-89w. Dry. TD 4,577 ft. in Morrison.

Crook County, Moorcroft area: Moore Development Co. 1 Moore, SW SW SW 25-49n-67w. Dry. TD 3,225 ft. in Dakota.

Rocky Ford: E. M. Thomason 1 Mathews, SE SW SW 11-51n-62w. Completed as water well. TD 118 ft.

Hot Springs County, Owl Creek area: Wyoming Minerals 1 Daniels, SE SW SW 32-9n-2e(WRM). Dropped from report until operations resume. TD 4,623 ft. in Embar.

Laramie County, Chugwater area: W. C. Franks and H. J. Holperin 1 Sells, C NE SW 6-19n-67w. Completed as water well. TD 4,607 ft. in Fox Hills.

Niobrara County: Halbert & Jennings 1 Courie, NE NE NW 33-37n-64w. Dry. TD 7,737 ft. in Dakota.

Snyder Creek area: Northern Drilling Co. 1 Government-Jarvis, C SE SE 2-40n-67w. IPF 48 BOPD, Newcastle discovery, new field. TD 7,690 ft. in Newcastle.

Cheyenne River area: Trigood Oil 2-A Government-Murray, N½ SW SW 26-41n-66w. IPF 462 BOPD, 7/16-in. TD 7,480 ft. in Newcastle.

Platte County, Meadow Lake Area: E. I. Mead 1 Mowery, NW SE NW 24-30n-66w. Dry. TD 1,220 ft. Suspended.

Wittenberger & Ankarlo 1 McLeod, NE SE SW 26-23n-69w. Dry. TD 1,040 ft. in granite.

Sublette County, Tip Top unit: General Petroleum 18-20 Tip Top unit, SW SW SW 20-28n-113w. IPF 25 BOPD, 1,700 M.c.f. of gas per day. Frontier discovery, new pay. TD 8,041 ft. in Beckwith.

UTAH

Duchesne County, Minnie Maud Unit: El Paso Natural Gas Co. 1 Unit, NE NE NE 31-11s-16e. Dry. TD 3,808 ft. in Wasatch.

Grand County, Cisco Nose: D&N Mining Co. 1 Murray, Blk 8, Cisco Township, 24-21s-23e. Dry. TD 560 ft. in Morrison.

Cisco Nose: Utah Southern 1 Strat, NW NW SW 20-21s-23e. Dry. TD 1,542 ft.

Kane County, Rees Canyon: Byrd Corp. 1 Government, C SW SW 5-40s-5e. Dry. TD 10,045 ft. in Pennsylvanian.

San Juan County, Bluff Bench Unit: Carter Oil Co. 1 Bluff Bench Unit, C NW SW 29-39s-22e. Dry. TD 7,811 ft. in Elbert.

COLORADO

Baca County: Carter Oil Co. and British-American 1 State, Lot 14, Tract 66, Sec. 36-33s-44w. Dry. TD 6,345 ft. Arbuckle.

Huerfano County, Alamo Dome: Lewis Drilling Co. 1 Major Ranch, SW SW NE 2-28s-68w. Dry. TD 5,895 ft. in Dakota 4,500-ft. base Morrison test.

Logan County, West Plains: British-American 1 Sanders, C NW NE 31-10n-54w. IPF 204 BOPD, TD 5,455 ft. PBTD 5,279 ft. "J" sand.

Halbert & Jennings 1 Henderson, SE SE SE 34-6n-54w. Dry. TD 4,901 ft.

W. F. Rowland 1 Tompkins, NE NW NE 32-8n-54w. Dry. TD 5,215 ft.

South Texas Development Co. 4 Budin, C NE NW 12-8n-55w. Dry. TD 5,420 ft.

Morgan County: Rocky Mountain Standard 1 Queen, C SE SE 25-1n-56w. Dry. TD 5,250 ft.

New Drilling Co. 1 Davidson, SW SW NW 27-3n-57w. Dry. TD 5,705 ft.

Washington County: J. A. McRaie 1 Gamble, SW SW SW 7-1s-55w. Dry. TD 5,310 ft.

Weld County: S. D. Johnson and Cortlandt Dietler 2 Krieger, NW NW NW 14-4n-61w. Dry. TD 6,650 ft.

MANITOBA

J. P. Owen 5-32 North Coulter, LSD 5, 32-2-26w1. Dry. TD 3,740 ft.

J. P. Owen 13-32-10-25 Bekker-Bekker, LSD 13, 32-10-25w1. Dry. TD 1,759 ft.

Perry-Fulk-Bertram 6-36 Fairlie, LSD 6, 36-6-27w1. Dry. TD 3,158 ft.

SASKATCHEWAN

Canada Southern 10-30 Boxelder Creek, LSD 10, 30-11-29w3. Dry. TD 1,686 ft.

Seaboard-Tide Water 3-9 Cabri Crown, LSD 3, 9-19-18w3. Dry. TD 2,957 ft.

Imperial 7-19-31-21 Cook Lake, LSD 7, 19-31-21w3. Dry. TD 2,270 ft.

Tide Water 1 Foam Lake Crown, LSD 1, 29-32-12w2. Dry. TD 4,301 ft.

Rio-Prado 4-8 Mervin, LSD 4, 8-50-19w3. Big Gully oil well. TD 1,983 ft.

Tide Water 1 Valley Centre Crown, LSD 16, 10-33-14w3. Dry. TD 2,852 ft.

Rio-Prado 8-13 Wroxton, LSD 8, 13-26-33w1. Dry. TD 1,587 ft.

ALBERTA

Scurry-Banff-Rainbow 1 Wapita, LSD 6, 9-71-3w6. Dry. TD 4,300 ft.

Kroy-Anglo 17-7 East Mahaska, LSD 7, 17-56-12w5. Dry. TD 6,900 ft.

Great Plains-Triad-Muskeg 1-9 Gilwood, LSD 1, 9-73-18w5. Granite wash oil well. TD 8,355 ft.

Stanolind-Hudson's Bay E-1 Pembina Crown, LSD 12, 6-48-9w5. Cardium oil well. TD 5,656 ft.

Sinclair-Banff 1 Sexsmith Crown, LSD 13, 20-74-6w6. Dunvegan gas well. TD 4,101 ft.

Amerada "A" 13-6 Sturgeon Lake, Indian Reserve, LSD 13, 6-70-23w5. Dry. TD 10,023 ft.

NORTHWEST TERRITORIES

N.W.T. 1 Desmarais Lake. Dry. TD 2,610 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that SW¼-SW¼ sec. 22, T. 11 N., R. 20 W., S.B.M., California, containing 40 acres, within the known geologic structure of the Wheeler Ridge Field will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., May 12, 1954, when bids will be opened. Details of the lease offering, how and where to submit bids, and bid forms may be obtained upon request from the Manager of the Land Office, Los Angeles, California, or from the Bureau's Washington Office. L. E. Hoffman, Chief, Division of Minerals.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that the SW¼SW¼ sec. 28, T. 31 S., R. 24 E., M.D.M., California, within the known geologic structure of the Buena Vista Hills Oil and Gas Field will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., May 12, 1954, when bids will be opened. Details of the lease offering, how and where to submit bids, and bid forms may be obtained upon request from the Manager of the Land and Survey Office, Sacramento, California, or from the Bureau's Washington Office. L. E. Hoffman, Chief, Division of Minerals.

Otis Engineers to Study Venezuelan Pressure Wells

Two Otis Pressure Control engineers have gone to Venezuela where they will discuss with major operators a special installation of Otis safety valves for high pressure oil wells on Lake Maracaibo.

They are Lowell M. Wilhoit, vice president in charge of sales and service, and Phil Sizer, an Otis design engineer. Both are with Otis' home office in Dallas.

Conferences will be held to determine if any special engineering will be necessary for the application of Otis safety valves to the special installations.

Otis safety valves provide a means of automatically shutting off the flow in case of line breaks or any other condition which might cause a high pressure oil or gas well to flow wild. The safety devices are widely used in high pressure fields throughout the oil country.

"an outstanding contribution to the art of oil property valuation" —

OIL PROPERTY VALUATION

by PAUL PAINE, a consulting engineer with many years' experience in the oil production business

— because it covers such subjects as:

Oil properties and oil property interests . . . with definitions, examples, lists of required data, and a useful table giving the products of customary fractions used in dividing oil-property interests.

Unproved lands . . . including measures of value, the lease, selection rights, royalty, etc.

Oil and gas reserves . . . with definitions of terms, descriptions of methods . . . and all the working details.

Elements in valuation . . . including marketing; the gas; costs for acquisition, development, operations, taxes and overhead; and many other topics.

Valuation methods . . . explains the classic "engineering method" in detail with excellent examples of data compilations; describes other methods based on the time to pay out, the average daily barrels of oil production, the well itself, and the barrels in the ground; remarks on valuation compiled for the lender of money, on royalties, and on fair market value.

The examination and report . . . gives practical directions on how to go about a job, the examination of accounts, and the preparation of a report.

204 pages
$4.50

For sale by

READER SERVICE DEPARTMENT

THE OIL AND GAS JOURNAL

BOX 1260 • TULSA, OKLA.

HOW OIL IS FOUND

By Walter A. Ver Wiebe

Professor of Petroleum Geology at the University of Wichita

Here is a newly published book suited to the needs of the oil operator, lease operator, drilling contractor, and tax consultant. Written in a simple, easy-to-read style, with a new approach to the subject.

The choicest material available on petroliferous areas is presented. Facts on new methods used to find additional oil pools. Descriptions of more than 50 individual pools and 30 OIL REGIONS from all parts of the world are presented.

Information on rock texture, porosity, permeability, processes of sedimentation is supplied to the reader. Compositions of oil, plants, cycles and their significance are dealt with as well as the most favorable conditions for oil.

Techniques used to find oil deposits are explained fully. Electric logs, micrologs, radioactivity logs, rotary drilling and cable-tool drilling as well as well cuttings and a host of other methods are gone into in detail.

CHAPTERS INCLUDE:

1. **Seepages Point the Way**
2. **The Oil Rocks**
3. **Time and Place of Rock Formations**
4. **That Magic Word Structure**
5. **How Oil Is Formed**
6. **How Far Does Oil Travel?**
7. **Where Does Oil Accumulate?**
8. **Methods Used in Oil Findings**

- **Completely up to date**
- **312 illustrations, graphs, maps, etc.**
- **Pages 8½ x 11**
- **247 pages**
- **$8.50**

MAIL ORDER AND CHECK TO READER SERVICE

THE OIL AND GAS JOURNAL

BOX 1260 **TULSA, OKLA.**

ADVERTISERS

Aeroquip Corporation 18
Air Preheater Corporation, The 241
Aldrich Pump Co., The 98
Allis-Chalmers Mfg. Co. 43
Allis-Chalmers Mfg. Co. (Tractor Division) 64, 65
Allis Co., The Louis 211
Alten Foundry & Machine Works, Inc. 326
Aluminum Co. of America 40, 41
Amarillo Right Angle Pump Drive Co. 312
American Air Filter Co., Inc. 48, 49
American Bosch Corporation 47
American Brass Co., The 272
American Hoist and Derrick Company 303
American-LaFrance-Foamite Corp. 76
American Locomotive Company 32
American Manufacturing Co. of Texas 5
American Meter Company 279
American Steel & Wire Co. 30, 31
Ampco Metal, Inc. 300
Anchor Petroleum Company 182
Anderson Co., V. D. 294, 295
Ansul Chemical Co. 97
Armstrong Bros. Tool Co. 313
Armstrong Machine Works 253
Avondale Marine Ways, Inc. 27
Axelson Manufacturing Company 11
Bakelite Company
A Division of Union Carbide and Carbon Corporation 327
Baker Oil Tools, Inc. 110
Bank of Toronto, The 280
Barco Manufacturing Company 252
Barrett Division of Allied Chemical & Dye Corp. 83
Bauer & Black Division of The Kendall Company 67
Beacon Petroleum Company 187
Bendix Aviation Corporation 34
Bethlehem Supply Co. 187
Bi-Lateral Fire Hose Company 308
Black, Sivalls & Bryson, Inc. 188, 189
Blackmer Pump Company 296
Bonney Forge & Tool Works 270
Bovaird Supply Co., The 21
Bristol Company, The 12
Brodie Co., Inc., Ralph N. 315
Cameron Iron Works, Inc. 16
Cannon Electric Company 278
Carter Company, Inc., S. C. 89
Catawissa Valve & Fittings Co. 253
Caterpillar Tractor Co. 6
Chapman Valve Mfg. Co., The 94
Cities Service Oil Co. 277
Classified Advertising 350, 351, 352, 353, 354
CF&I Tubular Products, The Colorado Fuel and Iron Corporation 38
Columbia-Southern Chemical Corporation 81
Construction Machinery Companies 328
Continental Motors Corp. 63
Continental Supply Co., The 88
Cooper-Bessemer Corp., The 178
Coppus Engineering Corp. 3
Core Laboratories, Inc. 107
C-O-Two Fire Equipment Company 36
Crane Co. 7
Crose Manufacturing Co., Inc., M. J. 317
Crouse-Hinds Company 44, 45
Curtin & Co., W. H. 320
Cutler-Hammer, Inc. 8
Darling Valve and Mfg. Co. 284
Davison Chemical Corp., The 74, 75
Dayton Rubber Co. 334
Dean Brothers Pumps, Inc. 213
Delta Engineering Corporation 14, 15
Delta Engineering Sales Co. 311
Detroit Diesel Engine Division, General Motors Corp. 42
Dollinger Corporation 86
Dore', Co., John L. 292
Dow Corning Corporation 87
Dowell Incorporated 308
Dresser Engineering Company 193
Drilling & Service, Inc. 343
du Pont 296
Eaton Manufacturing Company, Axle Div. 66
Edward Valves, Inc. 319
Emerol Manufacturing Company, Inc. 20
Enardo Manufacturing Co. 256
Equivalent Valves Company 309
Fairbanks, Morse & Co. 278
Fleet-Line Co. 314
Flint Steel Corporation 262
Floridin Company 233
Fluor Corporation, Ltd., The 217
Foster Wheeler Corporation 51
Foxboro Company, The 25
Frontier Chemical Company 213
Fyr-Fyter Co., The 101
Gardner-Denver Company 50
Gasoline Plant Construction Corp. 191
Gaso Pump & Burner Mfg. Co. 80
General Geophysical Company 322
Gorman-Rupp Company, The 306
Goulds Pumps, Inc. 299
Grancell, I. H. 329
Griscom-Russell Co., The 99
Guiberson Corporation 286
H & M Pipe Beveling Machine Co. 285
Haering & Co., Inc., D. W. 235
Halliburton Oil Well Cementing Co. Inside Front Cover, 13
Hamer Oil Tool Company 302
Hammond Iron Works 68
Harnischfeger Corp. 59
Harrisburg Steel Corporation 251
Hazard Wire Rope Division of American Chain & Cable Co., Inc. Inside Back Cover
Hilliard Corporation, The 244
Houston Contracting Company 313
Houston Ready-Cut House Co. 320
Howe-Baker Corporation 307
Hudson Engineering Corporation 223, 224
Hughes Tool Co. Back Cover
Hunter Engineering Co., W. H. 113
Hyatt Bearings Division, General Motors Corp. 73
Independent Tank Company 342
Inferno Co., The 319
Ingersoll-Rand 95
Interstate Electronic Supply Corp. 342
Iverson Supply Company 245
Jensen Brothers Mfg. Co. 300
Jerguson Gage & Valve Co. 311
Jet-Lube Inc. 336
Jo-Bell Products, Inc. 220
Johnston & Jennings Company, The Division of Pettibone Mulliken Corporation 278
Johnston Testers, Inc. 39
Jones & Laughlin Steel Corporation Supply Division 14
Kellite Products, Inc. 225
Kellogg Co., The M. W. 55
Kennametal, Inc. 82
Klinger Limited, Richard 175
Kohler Co. 291
Koons, Inc., Charles A. 269
Koppers Company, Inc. 263
Ladish Co. 35
Lane-Wells Company 108
Larkin Packer Company, Inc. 283
LeGrand Suiciiff & Gell Limited 62
Leland Equipment Co. 251
Le Roi Company 52, 53
Lincoln Electric Company, The 205
Linde Air Products Company, A Division of Union Carbide and Carbon Corp. 261
Lone Star Cement Corporation 112
Lunkenheimer Co., The 84
Maloney-Crawford Tank & Mfg. Co. 77
Mark & Company, Clayton 105
Marlow Pumps 304, 305
Marsh Instrument Co. 28
Martin-Decker Corp. 56
Mathieson Chemical Corporation 23
McCord Corporation 240
McFarland Manufacturing Corp. 314
Mercoid Corp., The 332
Metallic Building Company 215
Metals Disintegrating Company, Inc. 297
Mid-Continent Supply Company 259
Midwest Piping Company, Inc. 85
Minneapolis-Honeywell Regulator Co., Industrial Division 264, 265
Mixing Equipment Co., Inc. 281
Morse Chain Company 100
Multi-Clean Products, Inc. 301
Nash Engineering Co. 201
National Airoil Burner Co., The 103
National Supply Co., The 60, 61
National Tank Company 256
National Tube Company 202, 203
Naylor Pipe Company 246
Nelson Electric Mfg. Co. 300
Nelson Electric Supply Co. 226
Norris Manufacturer, Inc., W. C. 171
Northwest Engineering Company 57
Oakite Products, Inc. 292
Ohio Injector Company 54
Oil and Gas Journal, The 213, 317, 330, 341
Oil Metering and Processing Equipment Corporation 226
Oil Well Supply Co. 4
Olsen Company, O. L. 219
OPW Corporation 9
Orbit Valve Company 209
Pacific Car and Foundry Company 226
Parco Company, The 314
Parkersburg Rig & Reel Co. 268
Parsons Company, The Ralph M. 274
Pedrick Tool & Machine Co. 239
Peerless Mfg. Co. 26
Peerless Pump Division of Food Machinery & Chemical Corporation 177
Peerless Supply Co. Inc. 309
Penberthy Injector Co. 273
Penner & Cheney 314
Petro-Chem Development Co., Inc. 102
Petroleum Electric Power Assn. 58
Philadelphia Gear Works, Inc. 267
Phoenix Manufacturing Company 277
Pipeline Anode Corporation 287
Powell Valves 10
Powers Regulator Company, The 46
Previews, Inc. 336
Price Company, H. C. 184, 185
Pritchard & Co., J. F. 260
Procon Incorporated 93
Raymond Concrete Pile Co. 266
Reed Roller Bit Company 289, 290
Refinery Engineering Co., The 282
Refinery Supply Co., The 312
Republic Flow Meters Co. 78
Ridge Tool Company, The 339
Robbins & Myers, Inc. 337
Roebling's Sons Company, John A. 17
Rolo Manufacturing Co. 303
Roots-Connersville Blower, A Division of Dresser Industries, Inc. 106
Royal Bank of Canada, The 221
Russell Engineering Company 222
Rust-Oleum Corporation 307
Sapulpa Tank Company 234
Sherman Products, Inc. 236
Smith Oil Tool Co., H. C. 318
Southern Mill & Mfg. Co. 250
Spang-Chalfant Division of The National Supply Co. 60, 61
Spicer Mfg., Div. of Dana Corp. 69, 70
Sprague Engineering and Sales Corp. 277
Stainless Welded Products Inc. 330
Station Construction Co. 336
Stearns-Roger Mfg. Co., The 172, 173
Steel Forgings, Inc. 314
Sun Shipbuilding & Dry Dock Company 22
Superior Combustion Industries, Inc. 90
Templeton, Kenly & Co. 320
Texas Company, The 91
Timken Roller Bearing Company, Steel and Tube Division 298
Torrington Company, The 96
Tretolite Company 19
Tube-Kote, Inc. 229
Tulsa Testing Laboratory 230
Union Carbide and Carbon Corporation, Bakelite Company 327
United States Rubber Company 29
U. S. Steel Corp. Subsidiaries 4, 30, 31, 79, 202, 203
United States Steel Supply Division 79
Universal Oil Products Co. 248, 249
Valley Electric Corp. 276
Vapor Recovery Systems Company, The 284
Vickers Incorporated 271
Vinson Supply Co. 37
Vogt Machine Co., Henry 33
Voss Co., Inc., J. H. H. 316
Wallace & Tiernan Products, Inc. 296
Wall Colmonoy Corporation 276
Warner Lewis Company 316
Warren Petroleum Corporation Front Cover
Watson-Stillman Fittings Division H. K. Porter Company, Inc. 195
Wedgeplug Valve Company, Inc. 310
Well Equipment Mfg. Corp. 275
Western Supply Company 258
Weyerhauser Timber Company 338
Wheatland Tube Company 71
Wheatley Pumps & Valves, Frank 333
Wheeling Machine Products Company 288
White-Roth Machine Corp. 331
Whitmor Homebuilders, Inc. 344
Williams Brothers 312
Willson Products, Inc. 220
Wilson Supply Company 198, 199
Winslow Engineering Co. 335
Wisconsin Motor Corporation 340
Wood's Sons Co., T. B. 320
Yale Machine Works 104
Yarnall-Waring Company 92
York Co., Inc., Otto H. 181
Young Radiator Company 72
Youngstown Sheet and Tube Company 189
Zink Company, John 214

ARMCO

Spiral Welded Casing

Seven carloads of Armco Casing delivered to a major oil company in Texas.

NOW IN STOCK AT THE FOLLOWING NATIONAL TANK COMPANY BRANCHES:

Abilene, Texas
Casper, Wyo.
Clay City, Ill.
Electra, Texas
Great Bend, Kan.
Hobbs, New Mexico
Houston, Texas
Lake Charles, La.
New Iberia, La.
Odessa, Texas
Oklahoma City, Okla.
Pampa, Texas
Corpus Christi, Texas
Seminole, Okla.
Shreveport, La.
Sidney, Neb.
Williston, N. D.
Edmonton, Alberta

- EXACT 40' LENGTHS
- HIGH COLLAPSE RESISTANCE
- UNIFORM WALL THICKNESS
- FAST RUNNING TIME
- SAVES TONNAGE
- SAVES MONEY

STOCKS CARRIED AT MILL READY FOR IMMEDIATE CARLOAD SHIPMENTS.

Distributed exclusively in U.S. and Canada by National Tank Company

Manufactured by Armco Drainage & Metal Products, Inc.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

"Very good. We stopped in to see the local Hazard distributor and had him show us their ton-mile book. I thought it would be complicated but the way it's laid out we got the idea immediately.

"We bought a line from him and kept track of every tour just the way the log sheets in the Hazard ton-mile book call for, and we follow the cutoff system according to instructions. We've already got more service out of the Hazard LAY-SET Preformed drilling line than out of any others we've used, and the Hazard line looks like it's good for a long time yet."

The days are gone when you could put on a line, run it to death, then get a new one. You'd go broke operating that way today. Get the habit of seeing how many ton-miles you can get from a drilling line... to be specific, a HAZARD LAY-SET Preformed rotary drilling line.

Your nearby HAZARD distributor has a stock of all popular drilling lines and can give you quick service. Let him tell you why they're so good, and let him show you how easy you can put a ton-mile book to work on your rig. You'll save money if you do. See him today.

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

PLANTS: Houston, Tex., Wilkes-Barre, Pa.
OFFICES AND WAREHOUSES: Odessa, Tex., San Francisco, Pittsburgh, Philadelphia, New York, Los Angeles, Denver, Chicago, Atlanta • Bridgeport, Conn.

We're drilling on Iron

to learn more about bearings

Bits are being run on heat-treated alloy steel blocks in the continuous and exhaustive bearing tests now in progress in the Hughes Laboratory. The steel blocks prevent the bits from making hole too fast, yet permit the stresses and irregular bearing loadings that occur in actual drilling to be simulated. In these tests, the bits are run under extreme loads and at specified rotary speeds, with drilling mud circulating through the drill stem.

Because all phases of the tests can be closely controlled and duplicated, we are provided with an accurate basis for measuring comparative results and for better evaluating bearing performance. This study is only one of many rock bit research projects in progress at HUGHES looking to the constant improvement of Hughes rock bits.